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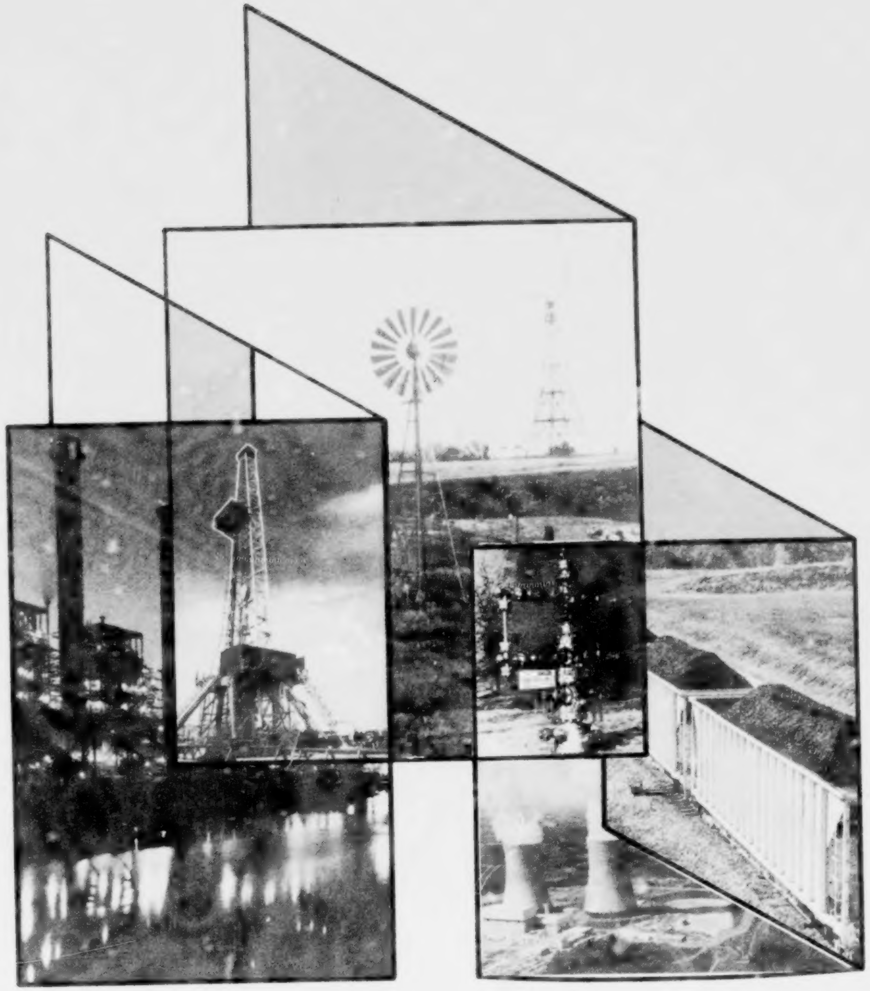

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Annual Energy Review

The *Annual Energy Review* presents historical data on production, consumption, stocks, imports, exports, and prices of the principal energy commodities in the United States. Also included are data on international production of crude oil, consumption of petroleum products, petroleum stocks, and production of electricity from nuclear-powered facilities.

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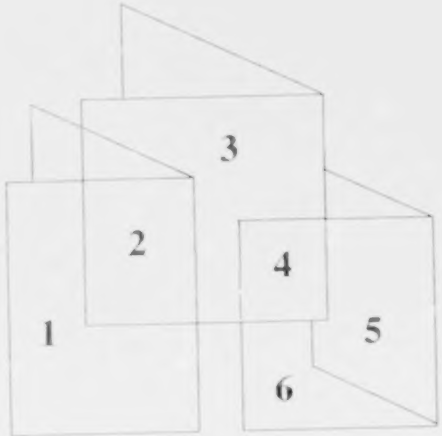

1. The Haynes Generating Station provides power in the Los Angeles area. Photograph courtesy of the Department of Water and Power, City of Los Angeles, California.
2. This is a drilling rig typical of those used by the oil industry.
3. An innovative wind turbine can be used to generate power more efficiently than the old-fashioned windmill.
4. A gas wellhead is referred to as a Christmas tree by the industry. Photograph courtesy of the Arkansas Louisiana Gas Company.
5. Unit trains are a primary transporter of coal. Photograph courtesy of the National Coal Association.
6. The cooling towers of a nuclear power plant reach toward the sky.

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Annual Energy Review 1988

Energy Information Administration
Office of Energy Markets and End Use
U.S. Department of Energy
Washington, DC 20585

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Major Energy Developments, 1988

Economic Growth, Adverse Weather Boost Energy Demand

U.S. total energy consumption[1] in 1988 reached a record level of nearly 80 quadrillion Btu (3)[2] as growth in the economy, adverse weather conditions, and continuing low oil prices combined to increase energy demand.

Real gross national product (GNP) was up by nearly 4 percent compared with 1987 GNP (C1). Increased manufacturing output spurred energy demand in the industrial sector.

Unusually cold weather in the first quarter of the year led to higher consumption of energy for space heating. In the summer, a record-breaking heat wave increased demand for energy, particularly electricity, for cooling. (At the same time, the second consecutive year of drought caused hydroelectric generation to fall to the lowest point in 11 years.)

In real terms,[3] the U.S. refiners' composite cost for a barrel of crude oil fell to $12.09, $3.12 below the 1987 level of $15.21 and $0.68 below the $12.77 level in 1986 (65), when excess worldwide production had caused prices to plunge to the lowest level in 13 years. The inability of members of the Organization of Petroleum Exporting Countries (OPEC) to restrain production played a role in the 1988 price decline (105).

The decline in the price of crude oil was severe enough to trigger small declines in the prices of the other fossil fuels, particularly natural gas, which is a more direct competitor. In real terms, the price per million Btu of crude oil fell 21 percent to $1.78. The real price of natural gas fell 1 percent to $1.26 and the real price of coal (excluding anthracite) fell 7 percent to $0.83 (27).

As a result of those and other factors, U.S. total energy consumption in 1988 increased 4 percent from the 1987 level. The Energy Information Administration estimates that the adverse weather conditions accounted for about 0.8 percentage points of that increase.[4]

Consumption of petroleum, natural gas, and coal all increased in 1988 (3). Consumption of petroleum products rose 3 percent to over 17 million barrels per day as consumption of all major products increased from 1987 levels (58). Natural gas consumption reached 18 trillion cubic feet, up 5 percent from the 1987 level (68). Coal consumption also registered a 5-percent increase, to 881 million short tons (78).

After 1986, the energy intensity of the U.S. economy moved very slightly upward, by less than 0.1 percent in 1987 and by 0.2 percent in 1988, as growth in energy consumption edged out growth in the economy (8). The adverse weather conditions in 1988 tended to drive up the energy intensity of the economy.

Exploration and Production: Mixed Results

Lower oil prices continued to depress domestic production of petroleum (crude oil, lease condensate, and natural gas plant liquids), which fell to 20 quadrillion Btu in 1988, down for the third consecutive year (2). Production in the Lower 48 States suffered the effects of a decreasing number of new well completions. Alaskan production of crude oil and lease condensate reached a record high (49) but failed to compensate for the decrease in Lower-48 production.

Exploration for oil and gas is closely tied to market conditions, particularly to the price of crude oil. In 1988, exploration indicators clearly reflected the low price of crude oil. The number of seismic crews totaled 182, up slightly from the number in 1987 but still dramatically below the 681 crews working in 1981 (39) when real crude oil prices peaked. Rotary rigs in operation were 936 in 1988 compared with 3,970 in 1981, and completions of exploratory wells totaled 5.9 thousand compared with 17.5 thousand in the peak year of 1981 (40).

---

[1] Total (gross) energy consumption includes energy consumed to produce, process, and transport energy.

[2] Numbers in parentheses indicate related tables. Annual data are the most recent available and frequently are preliminary.

[3] Real prices are expressed in constant 1982 dollars.

[4] Energy Information Administration, *Short-Term Energy Outlook* January 1989, DOE/EIA-0202(89/1Q) (Washington, DC, February 1989), p. 33.

In contrast, the domestic refinery industry benefited from market conditions in 1988, when falling crude oil prices and strong product demand tended to increase profit margins in the refining industry. In 1988, the refinery utilization rate—one measure of the health of the refining industry—rose to almost 85 percent, well above its nadir of 69 percent in 1981 (56).

Unlike petroleum production, production of all other major forms of energy except hydroelectricity increased in 1988 (2). Coal production continued at a record pace, totaling 21 quadrillion Btu and surpassing production of petroleum (crude oil, lease condensate, and natural gas plant liquids) for the second consecutive year. Natural gas production rose to 17 quadrillion Btu, up 1 percent from the previous year.

Spurred by extreme temperatures and the resulting increase in energy required for space heating and cooling, demand for electricity remained strong. Net generation rose 5 percent to 2.7 trillion kilowatthours (85). Coal-fired generation rose 5 percent to a record 1.5 trillion kilowatthours, despite increased competition from cheaply priced heavy oil. Oil-fired generation rose 26 percent but still accounted for a very small share of total generation (less than 6 percent), while coal continued to fuel over half of all generation.

U.S. nuclear-based generation reached an all-time high in 1988 of 527 billion kilowatthours and provided nearly 20 percent of total U.S. generation (95). The United States remained the world's largest producer of nuclear-based generation and its share of the total rose to 35 percent (115). Nuclear-based generation in all non-Communist countries combined reached 1.6 trillion kilowatthours in 1988.

Continued Growth in Energy Net Imports

Weak oil prices in 1988 tended to suppress domestic production while encouraging consumption, thereby contributing to growth in net energy imports. Net imports of all forms of energy combined rose 5 percent from the 1987 level to almost 13 quadrillion Btu—a level that fueled concerns about U.S. dependence on foreign sources of supply (5). However, due to the decline in oil prices, the real value of energy net imports fell from $30.6 billion in 1987 to $28.1 billion in 1988 (33).

Changes in the trade of all three major energy sources affected the growth in the volume of net imports. On a Btu basis, petroleum net imports rose 7 percent, natural gas net imports rose 30 percent, and coal net exports rose 20 percent (5).

Petroleum continued to account for most of the energy trade. In 1988, petroleum net imports reached 6.4 million barrels per day, the highest level since 1980 but still well below the peak level of 8.6 million barrels per day in 1977 (54). Petroleum net imports from all countries rose to 37 percent of U.S. demand in 1988. OPEC accounted for 3.4 million barrels per day, a 20-percent share of U.S. demand. Net imports from Canada and Mexico rose to 0.9 million barrels per day and 0.7 million barrels per day, respectively.

Major Energy Legislation in 1988

•On August 20, the President signed H.R. 1414 to extend the **Price-Anderson** authority (which provides for insurance for commercial nuclear power plants) for 15 years, to raise the level of compensation to about $7 billion, and to include a provision for civil and criminal penalties.

•The **Windfall Profit Tax** on domestic oil production was repealed by H.R. 4848, signed August 23. H.R. 4333, repealing the windfall profit tax reporting requirement, was signed November 10.

•On September 28, the President signed H.R. 5090 on the **Canadian Free-Trade Agreement,** which seeks to remove barriers to trade (including the trade of oil and uranium) between the United States and Canada.

•On October 14, the President signed S. 1518, the **Alternative Motor Fuels Act,** which promotes the development of alternate fuels, such as methanol from coal and natural gas, for transportation. The legislation also provides limited Corporate Average Fuel Economy (CAFE) credits for vehicles capable of burning alternate fuels.

1. Energy Overview

Energy Prices in a Volatile Market

Since the mid-1970's, changes in fossil fuel prices have become more frequent and more pronounced (27).[1] Prior to the Arab oil embargo of 1973–74, the composite real price[2] per million Btu of crude oil, natural gas, and coal had gradually declined from $1.12 in 1949 to a post-World War II low of $0.75 in 1969. In 1974, the real price rose to $1.25, eventually peaking at $2.92 in 1981 after a second round of crude oil price increases.

Thereafter, overproduction of crude oil began to affect energy prices and, when crude oil prices plunged in 1986, the composite real price of the major fossil fuels fell to $1.45. In 1987, the composite price declined slightly, to $1.44, and in 1988 it fell to $1.26.

Throughout the 40-year period, changes in the real price of oil dominated movements in the composite index. The real price of oil trended downward between 1949 and 1970 and then rose sharply in 1973–74 and again in 1979–81. Thereafter, in the face of shrinking demand and excess production, price trends reversed sharply. The precipitous declines in 1986 and 1988 brought the real price of oil to $1.78 per million Btu, the lowest level since 1973.

Prices of coal and natural gas were much less volatile than those of oil. Coal markets are generally more competitive than oil markets, where the output and pricing policies of the Organization of Petroleum Exporting Countries (OPEC) were a major influence throughout much of the 1970's and 1980's. Natural gas prices are subject to substantial State and Federal regulation. Throughout the 1970's, regulation dampened the response of natural gas prices relative to oil price movement.

However, the 1986 and 1988 declines in crude oil prices were severe enough to trigger declines in the prices of the other fossil fuels, particularly natural gas. In 1988, the real price of crude oil per million Btu was $1.78, 52 percent below the 1985 price (27). The real price of natural gas fell 38 percent, to $1.26, during the 4-year period. The decline in the real price of bituminous coal and lignite was smaller—a decrease of 20 percent, to $0.83, in the 4-year period.

Production

Historically, three fossil fuels have accounted for the bulk of domestic energy production, which by 1988 totaled 66 quadrillion Btu (2). Coal accounted for the largest share of domestic energy production in 1949–51 and, after a long hiatus, again in 1984–88. In the interim, first crude oil and then natural gas dominated domestic production. In 1988, coal production reached a record 21 quadrillion Btu. Crude oil production and dry natural gas production totaled 17 quadrillion Btu each. Natural gas plant liquids accounted for another 2 quadrillion Btu.

Electricity generation increased throughout 1949–88 (84), registering only one year-to-year decline (during the recession in 1982). Nuclear-based generation increased to the record level of 6 quadrillion Btu in 1988 (2). Since the mid-1970's, coal and nuclear fuels have provided increasing shares of fuel input for power generation, displacing substantial quantities of both petroleum and natural gas (87).

Hydroelectric generation accounted for over 1 quadrillion Btu of electricity in 1949 and from the 1970's through 1987 provided about 3 quadrillion Btu per year (2). In 1988, the second consecutive year of drought, hydroelectric generation totaled only 2.3 quadrillion Btu, the lowest level since 1966.

Other sources of renewable energy still provide only a small part of total domestic energy supplied. Generation of electricity from geothermal energy totaled 0.2 quadrillion Btu in 1988, and generation of electricity from wood, waste, wind, photovoltaic, and solar thermal energy totaled 0.02 quadrillion Btu.

---

[1] Numbers in parentheses indicate related tables. Annual data are the most recent available and frequently are preliminary.

[2] Real prices are expressed in constant 1982 dollars.

Consumption by Energy Source

Energy consumption more than doubled during the 1949–73 period, increasing from 30 quadrillion Btu in 1949 to 74 quadrillion Btu in 1973 (3), and the U.S. economy grew at about the same rate. The domestic energy market was dominated by rapid growth in petroleum and natural gas consumption, which more than tripled during the period.

After the 1973 oil price shock, energy consumption fluctuated, rising to a peak of 79 quadrillion Btu in 1979 before returning, in the mid-1980's, to about the same level as in 1973. In contrast, the economy registered a net expansion of about one-third.

The composition of demand after 1973 reflects a shift away from petroleum and natural gas towards electricity generated by other fuels. In 1973, petroleum and natural gas accounted for 77 percent of total energy consumption; by 1988, their share had declined to 66 percent.

Consumption by Sector: Sharing the Energy Pie

Industrial sector consumption proved to be the most responsive to the turmoil in energy markets during the 1970's and 1980's (4). Consumption fluctuated after 1973, but, in 1986, was considerably below the sector's peak consumption in 1979. Increases in efficiencies in industrial operations and expansion in the service trades were primarily responsible for the decline. In 1988, economic growth spurred demand for energy in the industrial sector, and industrial energy consumption rose 5 percent from the 1987 level to 29 quadrillion Btu.

Growth in electric utility consumption continued during the 1970's and 1980's despite rising energy prices. In 1988, that sector's consumption reached an all-time high of almost 29 quadrillion Btu. However, only 9 quadrillion Btu were sold to consumers; the remainder was used to generate, transmit, and distribute the electricity (87).

The transportation and residential and commercial sectors accounted for most of the growth in energy consumption during the 1949–88 period. Residential and commercial consumption leveled off in response to higher energy prices, but, following the price declines in 1986 and 1988, grew to a record level of 29 quadrillion Btu. Transportation sector consumption grew more slowly over the 40-year period but also attained a record level (22 quadrillion Btu) in 1988.

Changing Patterns of Trade

From 1958 forward, the United States consumed more energy than it produced, and the difference was met by energy imports (2, 3, and 5). Net imports of energy (primarily petroleum) grew rapidly through 1973, as demand for cheap foreign oil eroded quotas on petroleum imports. In 1973, net imports of petroleum totaled 13 quadrillion Btu.

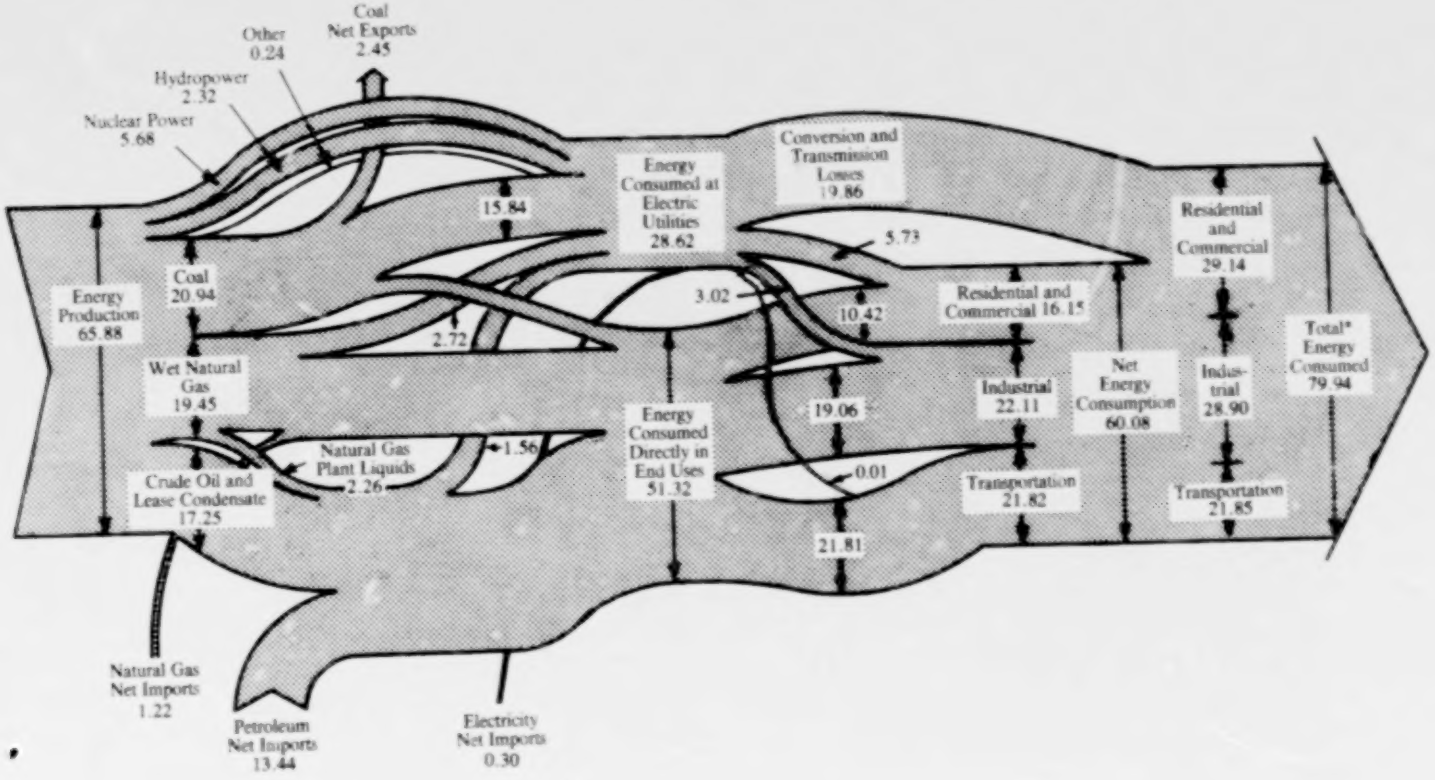
The Arab oil embargo of 1973–74, coupled with increases in the price of crude oil, interrupted growth in petroleum net imports, but nevertheless they climbed to a peak of 18 quadrillion Btu in 1977. That year, U.S. dependence on petroleum net imports also peaked, at 47 percent of consumption (54).

A second round of price increases, in 1979–81, suppressed demand for foreign oil. In 1985, petroleum net imports totaled 9 quadrillion Btu, and U.S. dependence fell to 27 percent of consumption. That was the last year in which the ratio of petroleum net imports to petroleum consumption declined. In 1988, as the price of crude oil continued to be repressed, net imports of petroleum rose to over 13 quadrillion Btu, and U.S. dependence on foreign sources of oil reached 37 percent. However, because of the decline in oil prices, the value of crude oil and petroleum product net imports fell from $37.6 billion in 1987 to $35.2 billion in 1988 (33).

Natural gas trade was limited to border countries until the advent of shipping natural gas in liquefied form. In 1988, natural gas net imports surpassed 1 quadrillion Btu for only the second time since 1949. Net imports of natural gas were valued at close to $3 billion.

Throughout the 1949-to-1988 period, the United States was a net exporter of coal (5). In 1988, net exports totaled 2 quadrillion Btu. Net exports of coal (including coal coke) were valued at nearly $4 billion.

Diagram 1. Total Energy Flow, 1988
(Quadrillion Btu)


Coal Net Exports 2.45
Other 0.24
Hydropower 2.32
Nuclear Power 5.68
15.84
Energy Consumed at Electric Utilities 28.62
Conversion and Transmission Losses 19.86
5.73
Residential and Commercial 29.14
Energy Production 65.88
Coal 20.94
3.02
10.42
Residential and Commercial 16.15
2.72
Total* Energy Consumed 79.94
Wet Natural Gas 19.45
19.06
Industrial 22.11
Net Energy Consumption 60.08
Indus-trial 28.90
Natural Gas Plant Liquids 2.26
1.56
Energy Consumed Directly in End Uses 51.32
0.01
Crude Oil and Lease Condensate 17.25
Transportation 21.82
Transportation 21.85
21.81
Natural Gas Net Imports 1.22
Petroleum Net Imports 13.44
Electricity Net Imports 0.30

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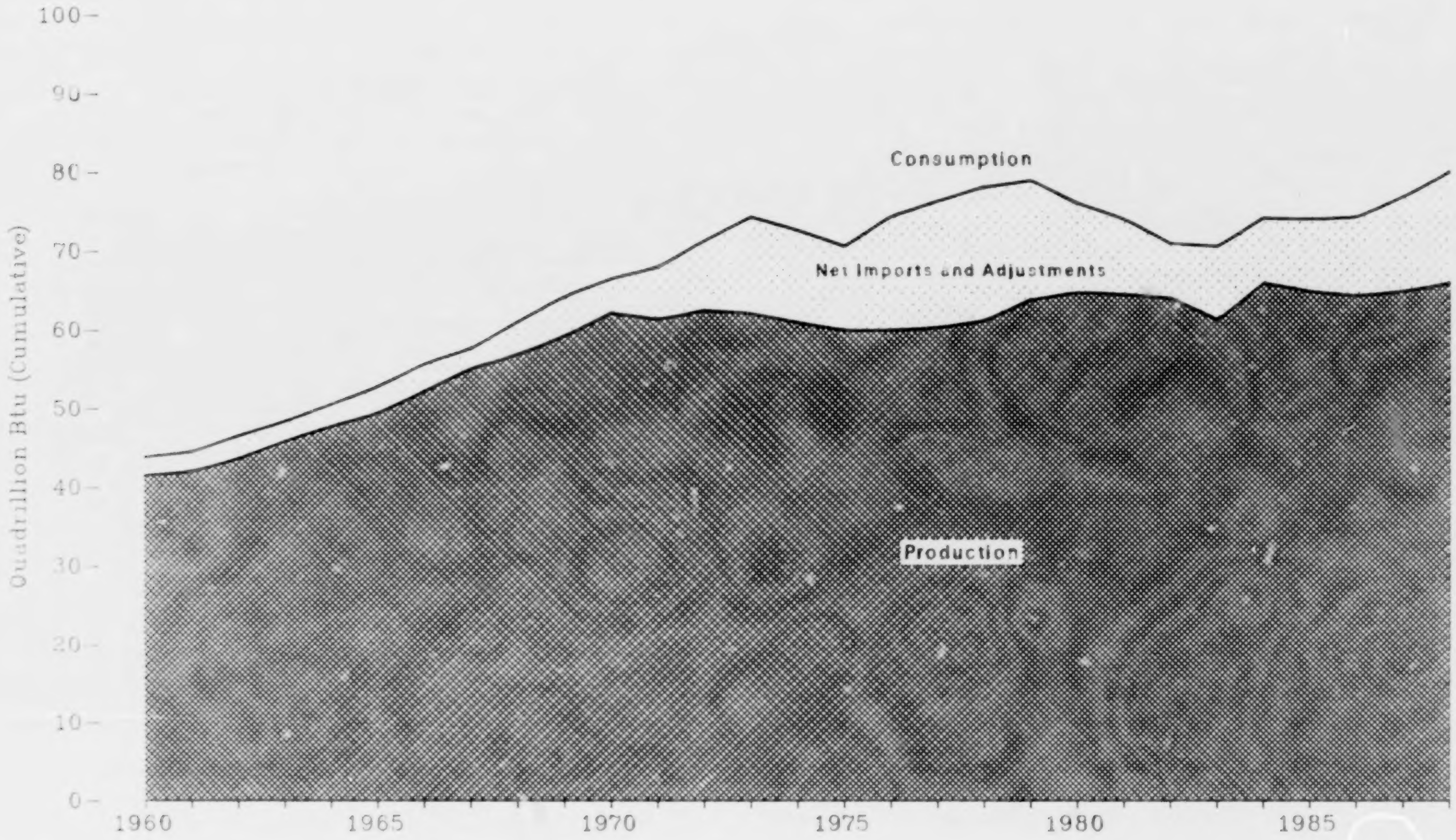
* Total energy consumed with conversion and transmission losses allocated to end-use sectors in proportion to the sectors' use of electricity.

Note: Sum of components does not equal total due to independent rounding; the use of preliminary conversion factors; and the exclusion of changes in stocks, miscellaneous supply and disposition, and unaccounted for quantities.

Sources: See Tables 2, 4, 5, and 87.

Figure 1. Energy Overview, 1960–1988



Source: See Tables 1, 2, and 3

Table 1. Energy Overview, Selected Years, 1960-1988

(Quadrillion Btu)

Activity and Energy Source	1960	1965	1970	1975	1980	1981	1982	1983	1984	1985	1986	1987	1988 [1]
Production													
Crude Oil and Lease Condensate	14.93	16.52	20.40	17.73	18.25	18.15	18.31	18.39	18.85	18.99	18.38	17.67	17.26
Natural Gas Plant Liquids	1.46	1.88	2.51	2.37	2.25	2.31	2.19	2.18	2.27	2.24	2.15	2.22	2.26
Natural Gas [2]	12.66	15.78	21.67	19.64	19.91	19.70	18.25	16.53	17.93	16.91	16.47	17.05	17.19
Coal	10.82	13.06	14.61	14.99	18.60	18.38	18.64	17.25	19.72	19.33	19.51	20.14	20.94
Nuclear Electric Power	0.01	0.04	0.24	1.90	2.74	3.01	3.13	3.20	3.55	4.15	4.47	4.91	5.68
Hydroelectric Power	1.61	2.06	2.63	3.15	2.90	2.76	3.27	3.53	3.35	2.94	3.02	2.59	2.32
Other [3]	(4)	0.01	0.02	0.07	0.11	0.13	0.11	0.13	0.17	0.21	0.23	0.24	0.24
Total Production	41.49	49.34	62.07	59.86	64.76	64.42	63.90	61.21	65.85	64.77	64.23	64.82	65.88
Imports													
Crude Oil [5]	2.20	2.65	2.81	8.72	11.19	9.34	7.42	7.08	7.30	6.81	9.00	10.07	10.83
Petroleum Products [6]	1.80	2.75	4.66	4.23	3.46	3.30	3.36	3.57	4.13	3.80	4.20	4.10	4.36
Natural Gas	0.16	0.47	0.85	0.98	1.01	0.92	0.95	0.94	0.85	0.95	0.75	0.99	1.28
Other [7]	0.07	0.04	0.07	0.19	0.31	0.42	0.36	0.44	0.48	0.54	0.48	0.60	0.48
Total Imports	4.23	5.92	8.39	14.11	15.97	13.97	12.09	12.03	12.76	12.10	14.43	15.76	16.95
Exports													
Coal	1.02	1.38	1.94	1.76	2.42	2.94	2.79	2.04	2.15	2.44	2.25	2.09	2.50
Crude Oil and Petroleum Products	0.43	0.39	0.55	0.44	1.16	1.26	1.73	1.57	1.54	1.66	1.67	1.63	1.75
Other [8]	0.03	0.09	0.18	0.16	0.14	0.12	0.11	0.11	0.11	0.14	0.14	0.13	0.15
Total Exports	1.48	1.85	2.66	2.36	3.72	4.33	4.63	3.72	3.80	4.23	4.05	3.85	4.40
Adjustments [9]	-0.43	-0.72	-1.37	-1.07	-1.05	-0.08	-0.51	1.00	-0.70	1.31	-0.36	0.04	1.51
Consumption													
Petroleum Products [10]	19.92	23.25	29.52	32.73	34.20	31.93	30.23	30.05	31.05	30.92	32.20	32.87	33.96
Natural Gas	12.39	15.77	21.79	19.95	20.39	19.93	18.51	17.36	18.51	17.83	16.71	17.67	18.60
Coal	9.84	11.58	12.26	12.66	15.42	15.91	15.32	15.89	17.07	17.48	17.26	18.01	18.81
Nuclear Power	0.01	0.04	0.24	1.90	2.74	3.01	3.13	3.20	3.55	4.15	4.47	4.91	5.68
Hydroelectric Power [11]	1.66	2.06	2.65	3.22	3.12	3.11	3.57	3.90	3.76	3.36	3.39	3.07	2.62
Other [12]	(4)	-0.01	-0.04	0.09	0.08	0.11	0.09	0.12	0.16	0.20	0.21	0.25	0.28
Total Consumption	43.80	52.68	66.43	70.55	75.96	73.99	70.85	70.52	74.10	73.95	74.24	76.77	79.94

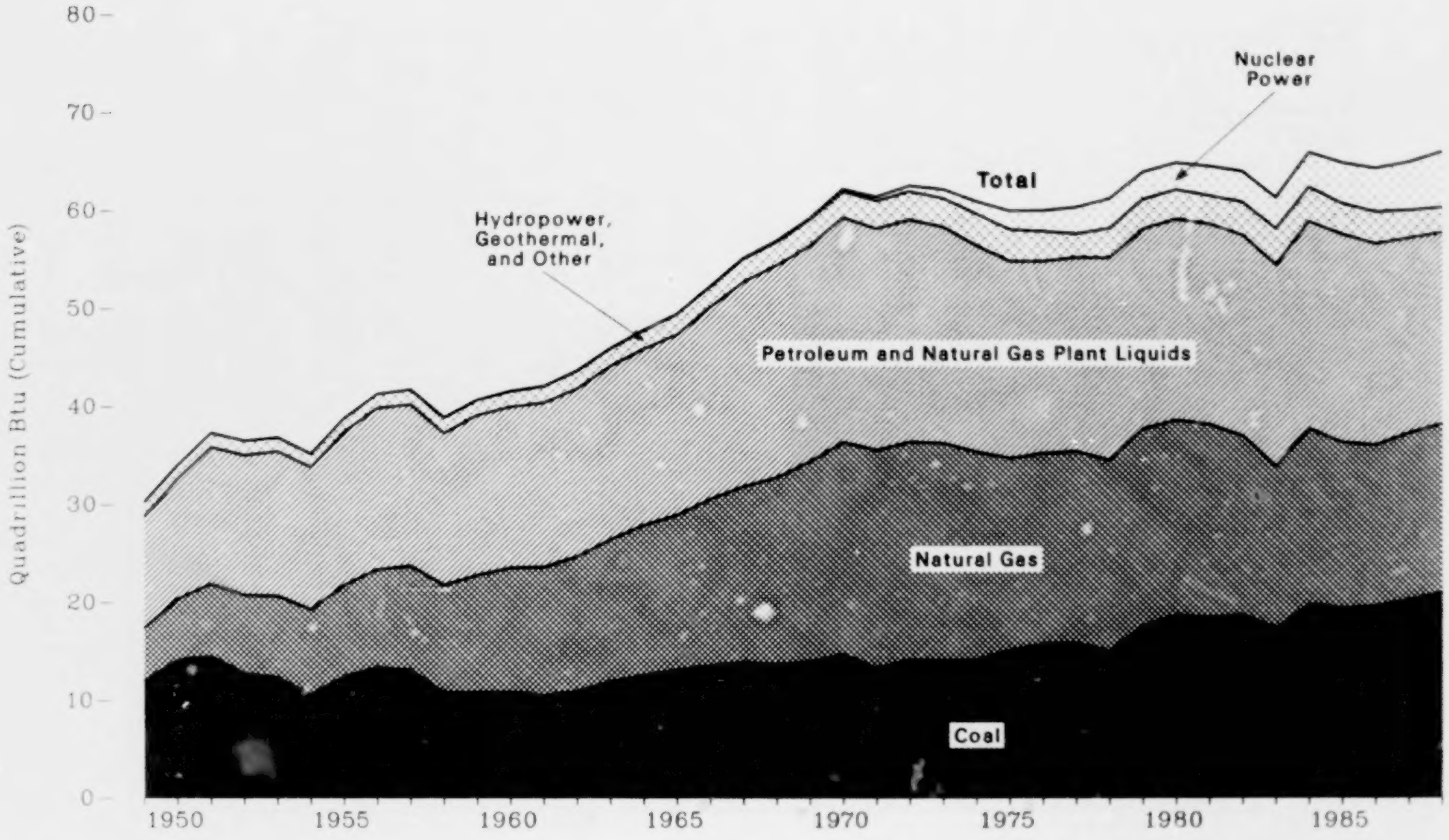
[1] Preliminary.
[2] Dry natural gas.
[3] Includes electricity produced from geothermal, wood, waste, wind, photovoltaic, and solar thermal sources connected to electric utility distribution systems (see Note).
[4] Less than 0.005 quadrillion Btu.
[5] Includes imports of crude oil for the Strategic Petroleum Reserve, which began in 1977.
[6] Includes imports of unfinished oils and natural gas plant liquids.
[7] Includes coal, coal coke, and hydroelectric power.
[8] Includes natural gas, coal coke, and hydroelectric power.
[9] A balancing item. Includes stock changes, losses, gains, miscellaneous blending components, and unaccounted for supply.
[10] Petroleum products supplied includes natural gas plant liquids and crude oil burned as fuel.
[11] Includes industrial generation of hydroelectric power and net electricity imports.
[12] Includes electricity produced from geothermal, wood, waste, wind, photovoltaic, and solar thermal sources connected to electric utility distribution systems (see Note) and net imports of coal coke.

Note: Data do not include the consumption of wood energy (other than that consumed by the electric utility industry) which amounted to an estimated 2.6 quadrillion Btu in 1984 (see Table 97). This table also does not include small quantities of other energy forms for which consistent historical data are not available, such as geothermal, waste, wind, photovoltaic, or solar thermal energy sources except that consumed by electric utilities.

Note: Sum of components may not equal total due to independent rounding.

Sources: Tables 48, 68, 76, 82, 84, and 86, EIA estimates for industrial hydroelectric power, and conversion factors in Appendix A.

Figure 2. Production of Energy by Source, 1949-1988



Source: See Table 2.

Table 2. Production of Energy by Source, 1949-1988

(Quadrillion Btu, Except as Noted)

Year	Coal	Natural Gas [1]	Crude Oil [2]	Natural Gas Plant Liquids	Hydroelectric Power [3]	Nuclear Electric Power [4]	Geothermal [4]	Other [5]	Total	Percent Change [6]
1949	11.97	5.38	10.68	0.71	1.42	0	0	0.01	30.18	—
1950	14.06	6.23	11.45	0.82	1.42	0	0	0.01	33.98	12.6
1951	14.42	7.42	13.04	0.92	1.42	0	0	0.01	37.22	9.5
1952	12.73	7.96	13.28	1.00	1.47	0	0	0.01	36.45	-2.1
1953	12.28	8.34	13.67	1.06	1.41	0	0	0.01	36.77	0.9
1954	10.54	8.68	13.43	1.11	1.36	0	0	(7)	35.13	-4.5
1955	12.37	9.34	14.41	1.24	1.36	0	0	(7)	38.73	10.2
1956	13.31	10.00	15.18	1.28	1.43	0	0	(7)	41.21	6.4
1957	13.06	10.61	15.18	1.29	1.52	0	0	(7)	41.65	1.1
1958	10.78	10.94	14.20	1.29	1.59	(7)	0	(7)	38.81	-6.8
1959	10.78	11.95	14.93	1.38	1.55	(7)	0	(7)	40.60	4.6
1960	10.82	12.66	14.93	1.46	1.61	0.01	0	(7)	41.49	2.2
1961	10.45	13.10	15.21	1.55	1.66	0.02	(7)	(7)	41.99	1.2
1962	10.90	13.72	15.52	1.59	1.82	0.03	(7)	(7)	43.58	3.8
1963	11.85	14.51	15.97	1.71	1.77	0.04	(7)	(7)	45.85	5.2
1964	12.52	15.30	16.16	1.80	1.89	0.04	(7)	(7)	47.72	4.1
1965	13.06	15.78	16.52	1.88	2.06	0.04	(7)	(7)	49.34	3.4
1966	13.47	17.01	17.56	2.00	2.06	0.06	(7)	(7)	52.17	5.7
1967	13.83	17.94	18.65	2.18	2.35	0.09	0.01	(7)	55.04	5.5
1968	13.61	19.07	19.31	2.32	2.35	0.14	0.01	(7)	56.81	3.2
1969	13.86	20.45	19.56	2.42	2.65	0.15	0.01	(7)	59.10	4.0
1970	14.61	21.67	20.40	2.51	2.63	0.24	0.01	(7)	62.07	5.0
1971	13.19	22.28	20.03	2.54	2.82	0.41	0.01	(7)	61.29	-1.3
1972	14.09	22.21	20.04	2.60	2.86	0.58	0.03	(7)	62.42	1.8
1973	13.99	22.19	19.49	2.57	2.86	0.91	0.04	(7)	62.06	-0.6
1974	14.07	21.21	18.57	2.47	3.18	1.27	0.05	(7)	60.84	-2.0
1975	14.99	19.64	17.73	2.37	3.15	1.90	0.07	(7)	59.86	-1.6
1976	15.65	19.48	17.26	2.33	2.98	2.11	0.08	(7)	59.89	0.1
1977	15.76	19.57	17.45	2.33	2.33	2.70	0.08	0.01	60.22	0.5
1978	14.91	19.49	18.43	2.25	2.94	3.02	0.06	(7)	61.10	1.5
1979	17.54	20.08	18.10	2.29	2.93	2.78	0.08	0.01	63.80	4.4
1980	18.60	19.91	18.25	2.25	2.90	2.74	0.11	(7)	64.76	1.5
1981	18.38	19.70	18.15	2.31	2.76	3.01	0.12	(7)	64.42	-0.5
1982	18.64	18.25	18.31	2.19	3.27	3.13	0.10	(7)	63.90	-0.8
1983	17.25	16.53	18.39	2.18	3.53	3.20	0.13	(7)	61.21	-4.2
1984	19.72	17.93	18.85	2.27	3.35	3.55	0.16	0.01	65.85	7.6
1985	19.33	16.91	18.99	2.24	2.94	4.15	0.20	0.01	64.77	-1.6
1986	19.51	16.47	18.38	2.15	3.02	4.47	0.22	0.01	64.23	-0.8
1987	20.14	17.05	17.67	2.22	2.59	4.91	0.23	0.02	64.82	0.9
1988[8]	20.94	17.19	17.26	2.26	2.32	5.68	0.22	0.02	65.88	1.6

[1] Dry natural gas.

[2] Includes lease condensate.

[3] Electric utility and industrial generation of hydroelectric power, see Appendix E, Note 1.

[4] Generated by electric utilities, see Explanatory Note 1.

[5] Includes electricity produced from wood, waste, wind, photovoltaic, and solar thermal sources connected to electric utility distribution systems. Converted to Btu by applying national average heat rates for fossil fuel steam electric plants. Data do not include the consumption of wood energy (other than that consumed by the electric utility industry) which amounted to an estimated 2.6 quadrillion Btu in 1984 (see Table 97). This table also does not include small quantities of energy forms for which consistent historical data are not available, such as geothermal, waste, wind, photovoltaic, or solar thermal energy sources except that consumed by electric utilities.

[6] Percent change from previous year calculated from data prior to rounding.

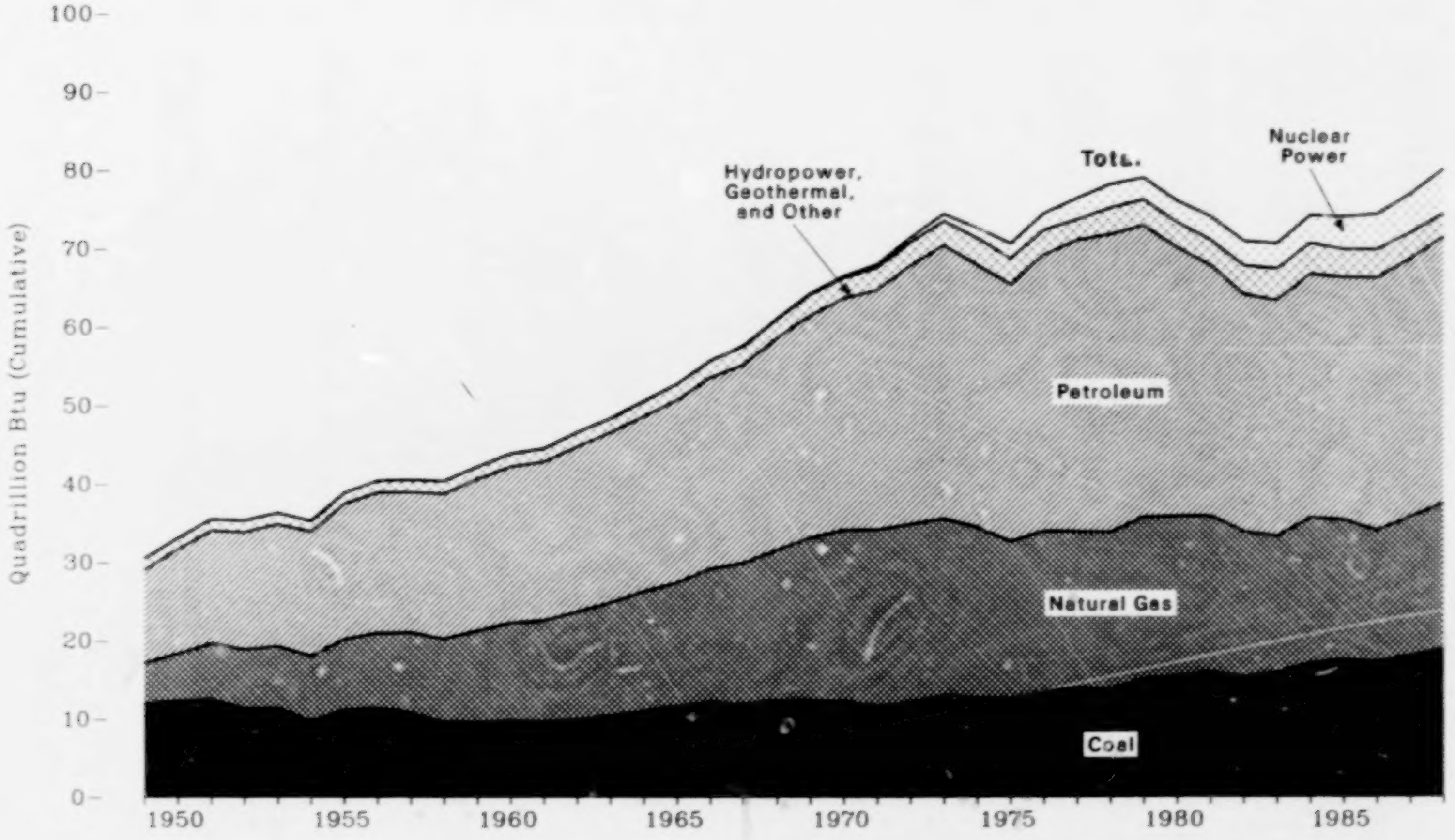
[7] Less than 0.005 quadrillion Btu.

[8] Preliminary.

Note: Sum of components may not equal total due to independent rounding.

Sources: Tables 48, 68, 77, and 86, EIA estimates for industrial hydroelectric power, and conversion factors in Appendix A.

Figure 3. Consumption of Energy by Source, 1949-1988



Source: See Table 3.

Table 3. Consumption of Energy by Source, 1949-1988

(Quadrillion Btu, Except as Noted)

Year	Coal	Natural Gas	Petroleum [1]	Hydroelectric Power [2]	Nuclear Electric Power [3]	Geothermal [3]	Other [4]	Total	Percent Change [5]
1949	11.98	5.15	11.88	1.45	0	0	(6)	30.46	—
1950	12.35	5.97	13.32	1.44	0	0	0.01	33.08	8.6
1951	12.55	7.05	14.43	1.45	0	0	- 0.02	35.47	7.2
1952	11.31	7.55	14.96	1.50	0	0	- 0.01	35.30	- 0.5
1953	11.37	7.91	15.56	1.44	0	0	(6)	36.27	2.7
1954	9.71	8.33	15.84	1.39	0	0	(6)	35.27	- 2.8
1955	11.17	9.00	17.25	1.41	0	0	- 0.01	38.82	10.1
1956	11.35	9.61	17.94	1.49	0	0	- 0.01	40.38	4.0
1957	10.82	10.19	17.93	1.56	0	0	- 0.02	40.48	0.3
1958	9.53	10.66	18.53	1.63	(6)	0	(6)	40.35	- 0.3
1959	9.52	11.72	19.32	1.59	(6)	0	- 0.01	42.14	4.4
1960	9.84	12.39	19.92	1.66	0.01	(6)	(6)	43.80	3.9
1961	9.62	12.93	20.22	1.68	0.02	(6)	- 0.01	44.46	1.5
1962	9.91	13.73	21.05	1.82	0.03	(6)	(6)	46.53	4.7
1963	10.41	14.40	21.70	1.77	0.04	(6)	- 0.01	48.32	3.9
1964	10.96	15.29	22.30	1.91	0.04	(6)	- 0.01	50.50	4.5
1965	11.58	15.77	23.25	2.06	0.04	(6)	- 0.02	52.68	4.3
1966	12.14	17.00	24.40	2.07	0.06	(6)	- 0.02	55.66	5.6
1967	11.91	17.94	25.28	2.34	0.09	0.01	- 0.01	57.57	3.4
1968	12.33	19.21	26.98	2.34	0.14	0.01	- 0.01	61.00	6.0
1969	12.38	20.68	28.34	2.66	0.15	0.01	- 0.03	64.19	5.2
1970	12.26	21.79	29.52	2.65	0.24	0.01	- 0.05	66.43	3.5
1971	11.60	22.47	30.56	2.86	0.41	0.01	- 0.03	67.89	2.2
1972	12.08	22.70	32.95	2.94	0.58	0.03	- 0.02	71.26	5.0
1973	12.97	22.51	34.84	3.01	0.91	0.04	(6)	74.28	4.2
1974	12.66	21.73	33.45	3.31	1.27	0.05	0.06	72.54	- 2.3
1975	12.66	19.95	32.73	3.22	1.90	0.07	0.02	70.55	- 2.8
1976	13.58	20.35	35.17	3.07	2.11	0.08	(6)	74.36	5.4
1977	13.92	19.93	37.12	2.51	2.70	0.08	0.02	76.29	2.6
1978	13.77	20.00	37.97	3.14	3.02	0.06	0.13	78.09	2.4
1979	15.04	20.67	37.12	3.14	2.78	0.08	0.07	78.90	1.0
1980	15.42	20.39	34.20	3.12	2.74	0.11	- 0.03	75.96	- 3.7
1981	15.91	19.93	31.93	3.11	3.01	0.12	- 0.01	73.99	- 2.6
1982	15.32	18.51	30.23	3.57	3.13	0.10	- 0.02	70.85	- 4.2
1983	15.89	17.36	30.05	3.90	3.20	0.13	- 0.01	70.52	- 0.5
1984	17.07	18.51	31.05	3.76	3.55	0.16	(6)	74.10	5.1
1985	17.48	17.83	30.92	3.36	4.15	0.20	(6)	73.95	- 0.2
1986	17.26	16.71	32.20	3.39	4.47	0.22	(6)	74.24	0.4
1987	18.01	17.67	32.87	3.07	4.91	0.23	0.02	76.77	3.4
1988[7]	18.81	18.60	33.96	2.62	5.68	0.22	0.06	79.94	4.1

[1] Petroleum products supplied including natural gas plant liquids and crude oil burned as fuel.

[2] Electric utility and industrial generation of hydroelectric power and net electricity imports.

[3] Generated by electric utilities.

[4] Includes net imports of coal coke and electricity produced from wood, waste, wind, photovoltaic, and solar thermal sources connected to electric utility distribution systems. Converted to Btu by applying national average heat rates for fossil fuel steam electric plants. Data do not include the consumption of wood energy (other than that consumed by the electric utility industry) which amounted to an estimated 2.6 quadrillion Btu in 1984 (see Table 97). This table also does not include small quantities of energy forms for which consistent historical data are not available, such as geothermal, waste, wind, photovoltaic, or solar thermal energy sources except that consumed by electric utilities.

[5] Percent change from previous year calculated from data prior to rounding.

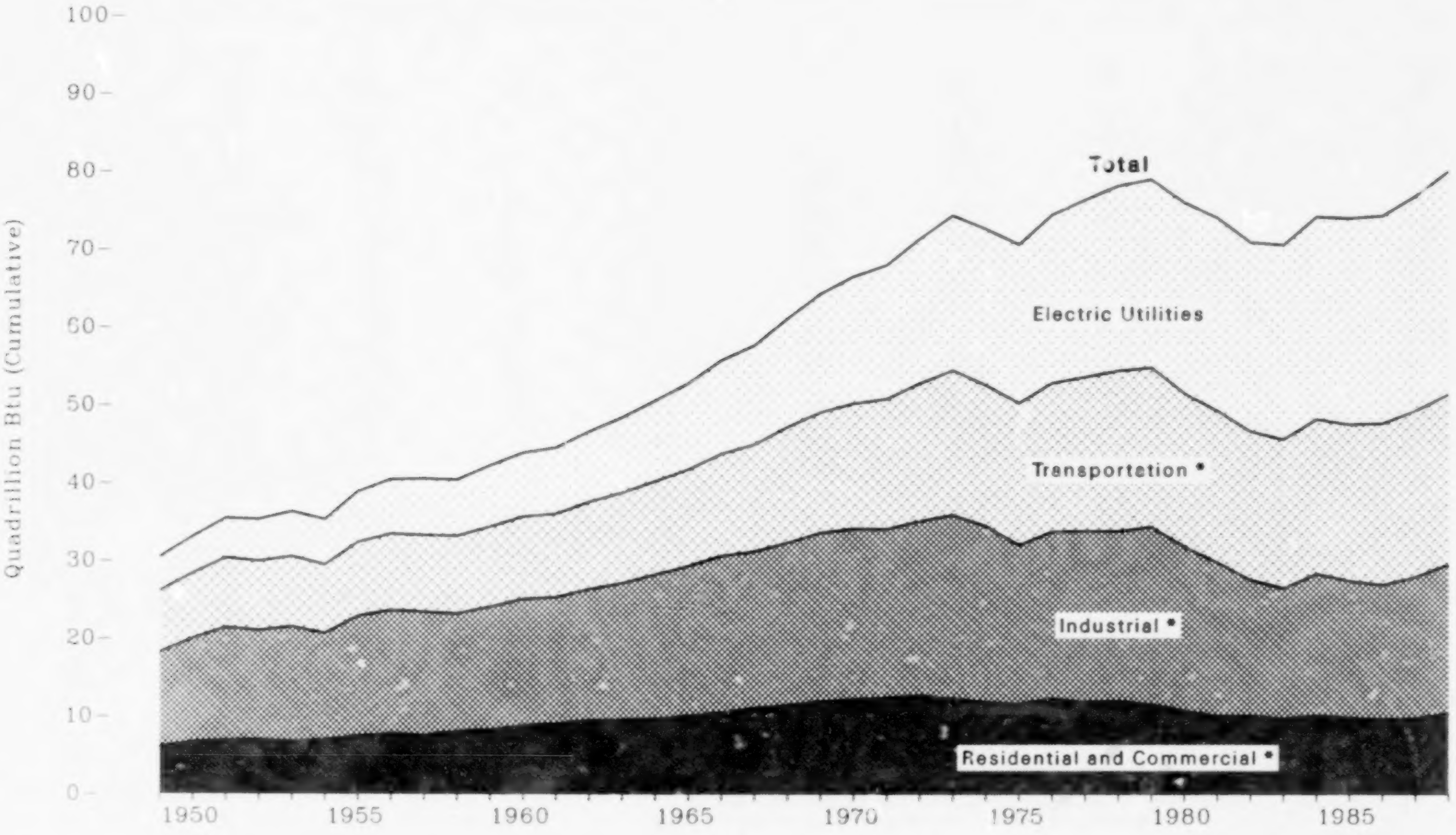
[6] Less than 0.005 quadrillion Btu.

[7] Preliminary.

Note: Sum of components may not equal total due to independent rounding.

Sources: Tables 48, 68, 76, 82, 84, and 86, EIA estimates for industrial hydroelectric power, and conversion factors in Appendix A.

Figure 4. Consumption of Energy by End-Use Sector, 1949-1988



*Fossil fuels only.
Source: See Table 4.

Table 4. Consumption of Energy by End-Use Sector,[1] 1949-1988

(Quadrillion Btu)

Year	Residential and Commercial		Industrial		Transportation		Electric Utilities	Total
	Fossil Fuels[2]	Total[3]	Fossil Fuels[2]	Total[3]	Fossil Fuels[2]	Total[3]		
1949	6.06	8.21	12.08	14.26	7.88	7.99	4.36	30.46
1950	6.65	8.87	13.28	15.71	8.38	8.49	4.70	33.08
1951	6.87	9.30	14.50	17.13	8.93	9.04	5.09	35.47
1952	6.92	9.54	14.05	16.76	8.91	9.00	5.36	35.30
1953	6.73	9.50	14.71	17.65	9.03	9.12	5.75	36.27
1954	6.92	9.78	13.67	16.58	8.82	8.90	5.80	35.27
1955	7.39	10.41	15.42	18.86	9.48	9.55	6.50	38.82
1956	7.71	10.96	15.87	19.55	9.79	9.86	6.98	40.38
1957	7.49	10.98	15.86	19.60	9.84	9.90	7.26	40.48
1958	7.99	11.64	15.14	18.70	9.95	10.00	7.22	40.35
1959	8.19	12.15	15.79	19.64	10.30	10.35	7.82	42.14
1960	8.75	13.04	16.26	20.16	10.56	10.60	8.19	43.80
1961	8.96	13.44	16.26	20.25	10.73	10.77	8.47	44.46
1962	9.45	14.27	16.83	21.04	11.19	11.23	9.03	46.53
1963	9.48	14.71	17.56	21.95	11.62	11.66	9.63	48.32
1964	9.60	15.23	18.56	23.27	11.96	12.00	10.33	50.50
1965	10.00	16.03	19.24	24.22	12.40	12.43	11.01	52.68
1966	10.47	17.06	20.09	25.50	13.07	13.10	11.99	55.66
1967	11.04	18.10	20.08	25.72	13.72	13.75	12.70	57.57
1968	11.40	19.23	20.85	26.90	14.83	14.86	13.88	61.00
1969	11.90	20.59	21.61	28.10	15.47	15.50	15.18	64.19
1970	12.14	21.71	21.92	28.63	16.06	16.09	16.27	66.13
1971	12.35	22.59	21.66	28.57	16.69	16.72	17.15	67.89
1972	12.64	23.69	22.39	29.86	17.68	17.71	18.52	71.26
1973	12.27	24.14	23.54	31.53	18.57	18.60	19.85	74.28
1974	11.77	23.72	22.62	30.69	18.09	18.12	20.02	72.54
1975	11.60	23.90	20.36	28.40	18.21	18.25	20.35	70.55
1976	12.25	25.02	21.44	30.24	19.06	19.10	21.57	74.36
1977	11.87	25.39	21.88	31.08	19.78	19.82	22.71	76.29
1978	11.91	26.09	21.84	31.39	20.58	20.61	23.72	78.09
1979	11.53	25.81	22.77	32.61	20.43	20.47	24.13	78.90
1980	10.72	25.65	21.04	30.61	19.66	19.69	24.50	75.96
1981	10.04	25.24	19.68	29.24	19.47	19.51	24.76	73.99
1982	10.06	25.63	17.45	26.14	19.03	19.07	24.27	70.85
1983	9.71	25.63	16.72	25.76	19.09	19.13	24.96	70.52
1984	10.09	26.49	18.18	27.74	19.83	19.87	25.98	74.10
1985	9.83	26.75	17.54	27.09	20.07	20.11	26.48	73.95
1986	9.58	27.02	17.26	26.45	20.73	20.77	26.64	74.24
1987	9.72	27.74	18.13	27.65	21.34	21.38	27.55	76.77
1988[4]	10.42	29.14	19.06	28.95	21.81	21.85	28.62	79.94

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[1] Data do not include consumption of wood energy (other than that consumed by the electric utility industry) which amounted to an estimated 2.6 quadrillion Btu in 1984 (see Table 97). This table also does not include small quantities of other energy forms for which consistent historical data are not available, such as geothermal, waste, wind, photovoltaic, or solar thermal energy sources except that consumed by electric utilities. See Appendix E, Note 2.

[2] Includes only those fossil fuels consumed directly in the sector (see Diagram 1).

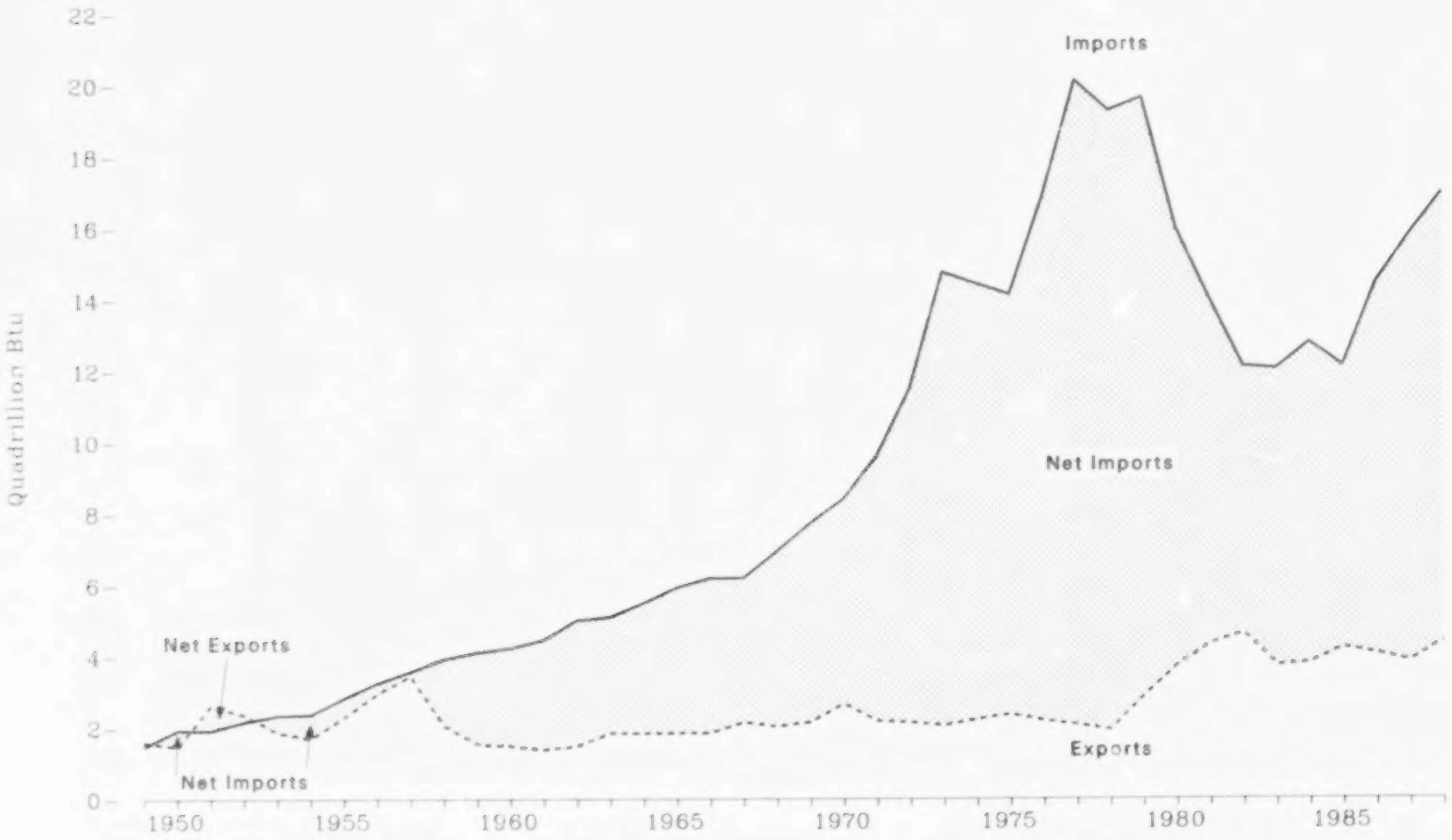
[3] Includes those fossil fuels consumed directly in the sector, utility electricity sales to the sector, and energy losses in the conversion and transmission of electricity. Conversion and transmission losses are allocated to sectors in proportion to electricity sales to sectors (see Diagram 1).

[4] Preliminary.

Note: Sum of components may not equal total due to independent rounding.

Sources: Tables 59, 72, 78, 82, 85, and 89, EIA estimates for industrial hydroelectric power, and conversion factors in Appendix A.

Figure 5. Energy Imports, Exports, and Net Imports, 1949–1988



Source: See Table 5.

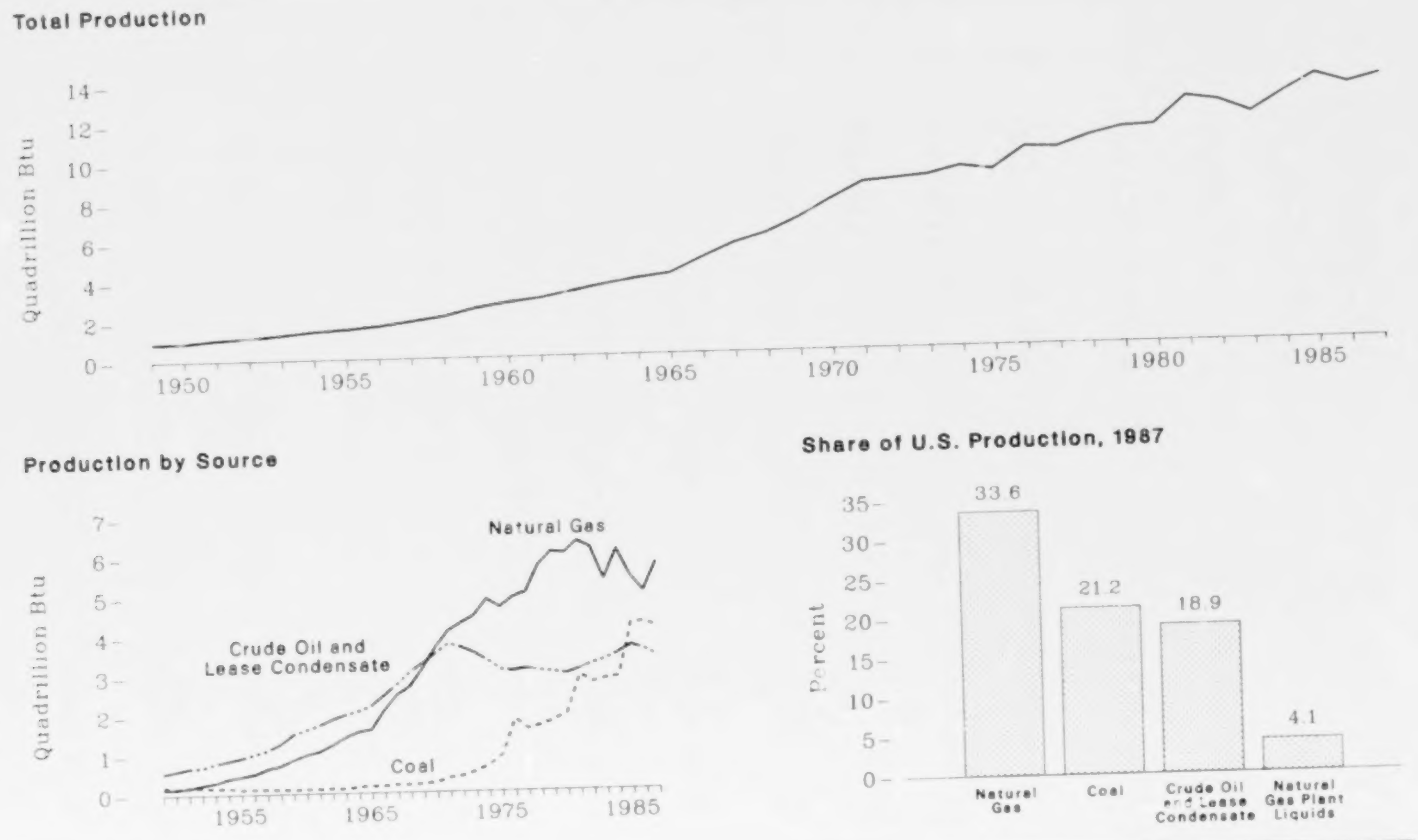
Table 5. Energy Imports, Exports, and Net Imports, 1949-1988

(Quadrillion Btu)

	Imports					Exports					Net Imports[1]				
Year	Coal	Natural Gas (Dry)	Petroleum[2]	Other[3]	Total	Coal	Natural Gas (Dry)	Petroleum	Other[3]	Total	Coal	Natural Gas (Dry)	Petroleum[2]	Other[3]	Total
1949	0.01	(4)	1.43	0.03	1.47	0.88	0.02	0.68	0.02	1.59	-0.87	-0.02	0.75	0.02	-0.13
1950	0.01	(4)	1.89	0.04	1.93	0.79	0.03	0.64	0.01	1.47	-0.78	-0.03	1.24	0.03	0.47
1951	0.01	(4)	1.87	0.04	1.92	1.68	0.03	0.89	0.03	2.62	-1.67	-0.03	0.98	0.01	-0.71
1952	0.01	0.01	2.11	0.04	2.17	1.40	0.03	0.91	0.02	2.37	-1.40	-0.02	1.20	0.02	-0.20
1953	0.01	0.01	2.28	0.04	2.34	0.98	0.03	0.84	0.02	1.87	-0.97	-0.02	1.44	0.02	0.47
1954	0.01	0.01	2.32	0.04	2.37	0.91	0.03	0.75	0.01	1.70	-0.91	-0.02	1.58	0.02	0.67
1955	0.01	0.01	2.75	0.06	2.83	1.46	0.03	0.77	0.02	2.29	-1.46	-0.02	1.98	0.04	0.54
1956	0.01	0.01	3.17	0.06	3.25	1.98	0.04	0.91	0.02	2.95	-1.98	-0.03	2.26	0.04	0.30
1957	0.01	0.04	3.46	0.06	3.57	2.17	0.04	1.20	0.03	3.45	-2.16	(4)	2.26	0.02	0.12
1958	0.01	0.14	3.72	0.05	3.92	1.42	0.04	0.58	0.02	2.06	-1.41	0.10	3.14	0.03	1.86
1959	0.01	0.14	3.91	0.05	4.11	1.05	0.02	0.45	0.02	1.54	-1.04	0.12	3.46	0.03	2.57
1960	0.01	0.16	4.00	0.06	4.23	1.02	0.01	0.43	0.02	1.48	-1.02	0.15	3.57	0.04	2.74
1961	(4)	0.23	4.19	0.04	4.46	0.98	0.01	0.37	0.02	1.38	-0.98	0.22	3.82	0.02	3.08
1962	0.01	0.42	4.56	0.03	5.01	1.08	0.02	0.36	0.03	1.48	-1.08	0.40	4.20	(4)	3.53
1963	0.01	0.42	4.65	0.03	5.10	1.36	0.02	0.44	0.03	1.85	-1.35	0.40	4.21	-0.01	3.25
1964	0.01	0.46	4.96	0.07	5.49	1.34	0.02	0.43	0.06	1.84	-1.33	0.44	4.53	0.01	3.65
1965	0.00	0.47	5.40	0.04	5.92	1.38	0.03	0.39	0.06	1.85	-1.37	0.44	5.01	-0.02	4.06
1966	(4)	0.50	5.63	0.05	6.18	1.35	0.03	0.41	0.06	1.85	-1.35	0.47	5.21	-0.01	4.32
1967	0.01	0.58	5.56	0.04	6.19	1.35	0.08	0.65	0.06	2.15	-1.35	0.50	4.91	-0.02	4.04
1968	0.01	0.67	6.21	0.04	6.93	1.38	0.10	0.49	0.06	2.03	-1.37	0.58	5.73	-0.02	4.90
1969	(4)	0.75	6.90	0.06	7.71	1.53	0.05	0.49	0.08	2.15	-1.53	0.70	6.42	-0.02	5.56
1970	(4)	0.85	7.47	0.07	8.39	1.94	0.07	0.55	0.11	2.66	-1.93	0.77	6.92	-0.04	5.72
1971	(4)	0.96	8.54	0.08	9.58	1.55	0.08	0.47	0.07	2.18	-1.54	0.88	8.07	(4)	7.41
1972	(4)	1.05	10.30	0.11	11.46	1.53	0.08	0.47	0.06	2.14	-1.53	0.97	9.83	0.05	9.32
1973	(4)	1.06	13.47	0.20	14.73	1.43	0.08	0.49	0.06	2.05	-1.42	0.98	12.98	0.14	12.68
1974	0.05	0.99	13.13	0.25	14.41	1.62	0.08	0.46	0.06	2.22	-1.57	0.91	12.66	0.19	12.19
1975	0.02	0.98	12.95	0.16	14.11	1.76	0.07	0.44	0.08	2.36	-1.74	0.90	12.51	0.08	11.75
1976	0.03	0.99	15.67	0.15	16.84	1.60	0.07	0.47	0.06	2.19	-1.57	0.92	15.20	0.09	14.65
1977	0.04	1.04	18.76	0.26	20.09	1.44	0.06	0.51	0.06	2.07	-1.40	0.98	18.24	0.20	18.02
1978	0.07	0.99	17.82	0.36	19.25	1.08	0.05	0.77	0.03	1.93	-1.00	0.94	17.06	0.33	17.32
1979	0.05	1.30	17.93	0.33	19.62	1.75	0.06	1.00	0.06	2.87	-1.70	1.24	16.93	0.27	16.75
1980	0.03	1.01	14.66	0.28	15.97	2.42	0.05	1.16	0.09	3.72	-2.39	0.96	13.50	0.18	12.25
1981	0.03	0.92	12.64	0.39	13.97	2.94	0.06	1.26	0.06	4.33	-2.92	0.86	11.38	0.33	9.65
1982	0.02	0.95	10.78	0.35	12.09	2.79	0.05	1.73	0.06	4.63	-2.77	0.90	9.05	0.28	7.46
1983	0.03	0.94	10.65	0.41	12.03	2.04	0.06	1.57	0.05	3.72	-2.01	0.89	9.08	0.36	8.31
1984	0.03	0.85	11.43	0.45	12.76	2.15	0.06	1.54	0.05	3.80	-2.12	0.79	9.89	0.40	8.96
1985	0.05	0.95	10.61	0.49	12.10	2.44	0.06	1.66	0.08	4.23	-2.39	0.89	8.95	0.41	7.87
1986	0.06	0.75	13.20	0.43	14.43	2.25	0.06	1.67	0.07	4.05	-2.19	0.69	11.53	0.35	10.38
1987	0.04	0.99	14.16	0.56	15.76	2.09	0.05	1.63	0.07	3.85	-2.05	0.94	12.53	0.48	11.90
1988[5]	0.05	1.28	15.19	0.43	16.95	2.50	0.06	1.75	0.09	4.40	-2.45	1.22	13.44	0.34	12.55

[1] Net imports = imports minus exports.
[2] Includes imports into the Strategic Petroleum Reserve which began in 1977.
[3] Coal coke and small amounts of electricity transmitted across U.S. borders with Canada and Mexico.
[4] Less than 0.005 quadrillion Btu.
[5] Preliminary.
Note: Sum of components may not equal totals or net import items due to independent rounding.
Note: Includes trade between the United States (50 States and the District of Columbia) and its territories and possessions.
Source: Tables 48, 52, 68, 76, 82, and 84 and conversion factors in Appendix A.

Figure 6. Production of Fossil Fuels on Federally Administered Lands, 1949-1987



Source: See Table 6.

Table 6. Production of Fossil Fuels on Federally Administered Lands, 1949-1987

Year	Crude Oil and Lease Condensate [1]			Natural Gas Plant Liquids [2]			Natural Gas [3]			Coal [4]			Total	
	Million Barrels	Quadrillion Btu	Percent U.S. Total [5]	Million Barrels	Quadrillion Btu	Percent U.S. Total [5]	Trillion Cubic Feet	Quadrillion Btu	Percent U.S. Total [5]	Million Short Tons	Quadrillion Btu	Percent U.S. Total [5]	Quadrillion Btu	Percent U.S. Total
1949	95.2	0.55	5.2	4.4	0.02	2.8	0.15	0.15	2.8	9.5	0.20	2.0	0.92	3.2
1950	105.9	0.61	5.4	4.4	0.02	2.4	0.14	0.15	2.4	7.7	0.16	1.4	0.94	2.9
1951	117.3	0.68	5.2	5.3	0.02	2.6	0.17	0.18	2.4	9.3	0.20	1.6	1.08	3.0
1952	118.7	0.69	5.2	5.5	0.02	2.5	0.25	0.25	3.2	8.7	0.18	1.7	1.15	3.3
1953	136.9	0.79	5.8	5.7	0.03	2.4	0.29	0.30	3.6	7.5	0.16	1.5	1.28	3.6
1954	146.5	0.85	6.3	6.1	0.03	2.4	0.39	0.40	4.6	7.4	0.16	1.8	1.43	4.2
1955	159.5	0.92	6.4	6.0	0.03	2.1	0.43	0.45	4.8	5.9	0.12	1.2	1.53	4.1
1956	174.1	1.01	6.7	6.4	0.03	2.2	0.49	0.51	5.1	5.8	0.12	1.1	1.67	4.2
1957	189.4	1.10	7.2	6.6	0.03	2.2	0.62	0.64	6.1	5.7	0.12	1.1	1.89	4.7
1958	216.8	1.26	8.9	8.0	0.04	2.7	0.69	0.71	6.5	5.3	0.11	1.2	2.11	5.7
1959	258.2	1.50	10.0	9.5	0.04	3.0	0.83	0.86	7.2	4.9	0.10	1.1	2.50	6.4
1960	277.3	1.61	10.8	11.6	0.05	3.4	0.95	0.98	7.8	5.2	0.11	1.2	2.75	6.9
1961	297.3	1.72	11.3	13.5	0.06	3.7	1.03	1.06	8.1	5.2	0.11	1.2	2.95	7.3
1962	321.7	1.87	12.0	15.3	0.07	4.1	1.18	1.22	8.9	5.8	0.12	1.3	3.27	7.8
1963	342.8	1.99	12.5	16.0	0.07	4.0	1.37	1.41	9.7	5.4	0.11	1.1	3.58	8.1
1964	356.0	2.07	12.8	15.5	0.07	3.7	1.51	1.55	10.2	7.1	0.15	1.4	3.84	8.4
1965	378.6	2.20	13.3	14.3	0.06	3.2	1.56	1.61	10.2	8.2	0.17	1.6	4.04	8.5
1966	426.7	2.47	14.1	15.2	0.06	3.2	2.02	2.09	12.3	8.3	0.17	1.5	4.80	9.6
1967	472.6	2.74	14.7	20.1	0.09	3.9	2.41	2.48	13.8	9.5	0.20	1.7	5.51	10.5
1968	523.7	3.04	15.7	13.7	0.06	2.5	2.61	2.69	14.1	9.1	0.19	1.6	5.97	11.0
1969	563.8	3.27	16.7	19.9	0.08	3.4	3.05	3.14	15.4	10.1	0.21	1.8	6.70	11.9
1970	605.6	3.51	17.2	40.6	0.17	6.7	3.56	3.67	16.9	12.0	0.25	2.0	7.60	12.8
1971	648.9	3.76	18.8	54.0	0.22	8.7	3.95	4.08	18.3	17.3	0.36	3.1	8.42	14.5
1972	630.5	3.66	18.2	56.7	0.23	8.9	4.17	4.28	19.3	19.0	0.40	3.1	8.56	14.5
1973	604.3	3.51	18.0	54.9	0.22	8.7	4.37	4.46	20.1	24.2	0.51	4.1	8.70	14.9
1974	570.2	3.31	17.8	61.9	0.25	10.1	4.75	4.87	22.9	32.1	0.67	5.3	9.10	16.1
1975	531.5	3.08	17.4	59.7	0.24	10.0	4.57	4.67	23.8	43.6	0.92	6.7	8.90	16.3
1976	525.7	3.05	17.7	57.2	0.23	9.7	4.81	4.91	25.2	86.4	1.82	12.6	10.00	18.3
1977	535.0	3.10	17.8	57.4	0.23	9.7	4.94	5.04	25.8	74.8	1.57	10.7	9.94	18.0
1978	523.6	3.04	16.5	25.9	0.10	4.5	5.60	5.71	29.3	79.2	1.66	11.8	10.51	19.1
1979	519.8	3.01	16.7	11.9	0.05	2.1	5.93	6.05	30.1	84.9	1.78	10.9	10.89	18.8
1980	510.4	2.96	16.2	10.5	0.04	1.8	5.85	6.01	30.2	92.9	1.95	11.2	10.96	18.6
1981	529.3	3.07	16.9	12.3	0.05	2.1	6.15	6.31	32.1	138.8	2.91	16.8	12.35	21.1
1982	552.3	3.20	17.5	15.0	0.06	2.7	5.97	6.14	33.6	130.0	2.73	15.5	12.13	21.1
1983	568.8	3.30	17.9	14.0	0.05	2.5	5.17	5.33	32.3	133.9	2.81	17.1	11.50	21.2
1984	595.8	3.46	18.3	25.4	0.10	4.3	5.88	6.07	33.8	136.3	2.86	15.2	12.48	21.2
1985	628.3	3.64	19.2	26.6	0.10	4.5	5.24	5.41	32.0	199.7	4.19	22.6	13.35	23.2
1986	608.4	3.53	19.2	23.3	0.09	4.1	4.87	5.01	30.4	201.6	4.23	22.6	12.86	22.8
1987	577.3	3.35	18.9	23.7	0.09	4.1	5.56	5.73	33.6	195.2	4.10	21.2	13.27	23.2

[1] Production from Naval Petroleum Reserve No. 1 (NPR#1) for 1974 and earlier years is for fiscal years (July through June).

[2] Includes only those quantities for which the royalties were paid based on the value of the natural gas plant liquids produced. Additional quantities of natural gas plant liquids were produced; however, the royalties paid were based on the value of natural gas processed. These latter quantities are included with natural gas.

[3] Includes same quantities of natural gas processed into liquids at natural gas processing plants and fractionators.

[4] Converted to British thermal units (Btu) based on an estimated heat content of coal produced on federally administered lands of 21 million Btu per short ton.

[5] Based on physical units.

Sources: **Coal:** •1949 through 1980—U.S. Geological Survey, *Coal, Phosphate, Potash, Sodium, and Other Mineral Production, Royalty Income, and Related Statistics*, June 1981. •1981 and forward—U.S. Minerals Management Service, *Mineral Revenues - The 1987 Report on Receipts from Federal and Indian Leases*, and predecessor annual reports. **Other:** •1949 through 1980—U.S. Geological Survey, *Oil and Gas Production, Royalty Income, and Related Statistics*, June 1981; Department of Energy, Office of Naval Petroleum and Oil Shale Reserves, unpublished data, and U.S. Geological Survey, National Petroleum Reserve in Alaska, unpublished data. •1981 through 1983—U.S. Minerals Management Service, *Mineral Revenues - The 1983 Report on Receipts from Federal and Indian Leases*, and predecessor annual reports; Department of Energy, Office of Naval Petroleum and Oil Shale Reserves, unpublished data; and U.S. Geological Survey, National Petroleum Reserve in Alaska, unpublished data. •1984 and forward—U.S. Minerals Management Service, *Mineral Revenues - The 1987 Report on Receipts from Federal and Indian Leases*, and predecessor annual reports, Department of Energy, Office of Naval Petroleum and Oil Shale Reserves, unpublished data.

2. Energy Consumption Indicators

Indicators of Energy Intensity

The relationship between total energy consumption and real gross national product (GNP) is a primary indication of the energy intensity of the economy. In 1970, 27 thousand Btu of energy was consumed for each constant 1982 dollar of GNP (8).[1] Higher energy prices in the early 1970's led to increases in energy efficiency and to the development of service industries at the expense of energy-intensive industries. As a result, the energy intensity of the economy as a whole fell to 20 thousand Btu per constant dollar in 1986, a decline of over one-fourth since 1970.

After the oil price collapse in 1986, energy intensity moved very slightly upward, by less than 0.1 percent in 1987 and by 0.2 percent in 1988. Adverse weather conditions in 1988—a colder-than-normal winter and a record-breaking heat wave in summer—tended to drive up the energy intensity of the economy.

A second indicator of energy intensity is per capita consumption. Throughout the 1960's and early 1970's, the growth of end-use energy consumption was greater than the growth of the population (7). Per capita consumption rose from 212 million Btu in 1960 to a peak of 285 million Btu in 1973. Thereafter, per capita consumption trended downward, to as low as 226 million Btu in 1983. In 1988, end-use energy consumption was 244 million Btu per capita.

Energy consumption per household,[2] a third indicator of energy intensity, declined from 138 million Btu in 1978 to 100 million Btu in 1987 (the most recent year for which data are available), with only one small upward fluctuation, which occurred in 1984. Lower use of distillate fuel oil and kerosene accounted for most of the decline (16).

Households in the South and West consumed the least amount of energy in 1987, an average of 83 million Btu per household in the South and 77 million Btu per household in the West. Energy consumption by households in the North Central Region averaged 123 million Btu per household. Households in the Northeast averaged 124 million Btu per household, surpassing the North Central average for the first time.

Household Uses of Energy

Energy consumed by households can be attributed to four primary applications: space heating, air conditioning, water heating, and appliance operation (17). In 1987, household energy consumption totaled 9 quadrillion Btu (16). Natural gas was the primary source of energy for space heating and provided the main source of heat in 50 million households (18).

In 1984 (the most recent year for which data are available), space heating was the most prevalent application of energy consumed by households and accounted for 5 quadrillion Btu (17). Nearly 2 quadrillion Btu were used to operate appliances and, as would be expected, electricity was the major source of energy for that application. Refrigerators, color television sets, ovens, and automatic clothes washers were the most common household appliances (19).

Electricity was essentially the only source of energy used for air conditioning. Although air conditioning accounted for only 4 percent of household energy consumption, it accounted for almost 8 percent ($7.5 billion) of total household energy expenditures of $97 billion (17).

The cost of energy used to operate appliances totaled $38 billion in 1984, and the cost for space heating was a close second at $37 billion. Energy expenses for water heating came to about $15 billion.

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[1] Numbers in parentheses indicate related tables. Annual data are the most recent available and frequently are preliminary.

[2] Five major energy sources—natural gas, electricity, distillate fuel oil, kerosene, and liquefied petroleum gases—are included in the data.

Improvements in Motor Vehicle Efficiency

Because motor gasoline consistently accounts for the largest share of all petroleum products supplied (58), demand for motor gasoline can have a significant effect on U.S. dependence on foreign sources of crude oil. In turn, the price and availability of crude oil influence motor gasoline demand.

In 1973, average annual mileage exceeded 10 thousand miles per passenger car (22). The fuel rate of passenger cars, which make up a sizable proportion of the U.S. motor vehicle fleet, was 13.3 miles per gallon. That measure of fuel efficiency had declined for the previous several years.

In 1973-74, however, crude oil supply interruptions and rising prices led to concerns about the continued availability of motor gasoline at desirable prices. Mileage per passenger car immediately declined, to an average of 9.6 thousand in 1974. At the same time, the fuel rate began to creep upward, and continued to increase throughout the remainder of the 1970's and 1980's, reaching 19.2 miles per gallon in 1987 (the most recent year for which data are available). Federal regulations designed to encourage improvements in the efficiency of the fleet played a role in the increases in fuel rates.

During 1987, however, new Federal legislation allowed States to raise the speed limit on some highways, and, by 1988, 41 States had increased speed limits. Because vehicles traveling at speeds above 55 miles per hour are less efficient, higher speed limits tend to increase demand for motor fuel. Other factors, such as relatively low motor gasoline prices and increases in highway travel, also tend to increase demand.

Energy Consumption at Commercial Buildings

In 1986 (the most recent year for which data are available), there were an estimated 4.0 million commercial buildings with approximately 57 billion square feet of floorspace in the United States (25). The largest number of commercial buildings, 1.6 million, were found in the South and accounted for 38 percent of the U.S. total (24). Space heating, cooling, and water heating were the three most prevalent end uses of energy in commercial buildings.

The four major energy sources at commercial buildings in 1986 were electricity, natural gas, fuel oil (kerosene, distillate fuel oil, and residual fuel), and district heat (purchased and nonpurchased steam and purchased and nonpurchased hot water). Electricity was found in nearly all commercial buildings and in a much greater percentage of buildings than its nearest competitor, natural gas (25). Fuel oil and district heat were found in relatively few buildings.

Electricity also predominated on a square footage basis. In 1986, 57 billion square feet of commercial space had electricity, compared with 37 billion square feet with natural gas, 11 billion square feet with fuel oil, and 5 billion square feet with district heat.

Energy consumption in commercial buildings in 1986 totaled 5.0 quadrillion Btu. Electricity accounted for 2.4 quadrillion Btu, followed by natural gas (1.7 quadrillion Btu) and fuel oil and district heat (0.4 quadrillion Btu each).

On a Btu basis, electricity was by far the most expensive source of energy consumed at commercial buildings, and as such it accounted for a disproportionate share of energy expenditures. Total energy expenditures of nearly $61 billion were divided as follows: $47.2 billion for electricity, $8.4 billion for natural gas, $2.1 billion for fuel oil, and $2.6 billion for district heat.

Nonfuel Use of Energy Sources

The amount of energy used for nonfuel purposes is small compared with the amount of energy consumed by end users or used in the production, processing, and transportation of energy. In 1988, the 5 quadrillion Btu consumed for nonfuel uses represented a 6-percent share of total energy consumption (13).

The nonfuel use of energy is overwhelmingly the use of petroleum products, primarily asphalt and road oil, liquefied petroleum gases (LPG), and petrochemical feedstocks. Use of petroleum for nonfuel purposes appears to be slightly more in 1988 than in 1980; the apparent increase reflects some combination of actual trends and changes in data collection procedures that resulted from the discontinuation of the Energy Information Administration's survey on LPG sales.

Consumption of Energy for Manufacturing

The U.S. manufacturing sector consumed an estimated 17.5 quadrillion Btu[3] to produce heat and power and to generate electricity in 1985 (the most recent year for which data are available). Natural gas accounted for 5.2 quadrillion Btu, a 30-percent share of total primary energy consumption (14). Coal accounted for 2.4 quadrillion Btu, a 14-percent share, and electricity[4] consumption for 2.2 quadrillion Btu, a 12-percent share. Fuel oil consumption of about 0.8 quadrillion Btu accounted for the smallest share, 4 percent.

Of all the industries, the petroleum and coal products industry was the largest user of primary energy in 1985, consuming 5.1 quadrillion Btu. At 3.6 quadrillion Btu, the chemicals and allied products industry was the second largest user. Together, the two industries accounted for half of the primary energy consumption in the manufacturing sector.

Because the manufacturing sector accounts for a large share of total U.S. energy consumption, manufacturers' ability to cope with fluctuations in energy supplies and prices by switching to alternative sources of energy plays a significant role in the Nation's energy security. Fuel switching capability[5] in 1985 was determined for five major energy sources: natural gas, purchased electricity, coal and coke, residual fuel oil, and distillate fuel oil (15).

Residual fuel oil registered the largest value (43 percent) for switchable consumption as a percentage of actual consumption, indicating substantial fuel-switching capabilities. Almost 20 percent of distillate fuel oil consumption could have been supplied by other sources. It is estimated that about 92 thousand barrels per day of fuel oil consumption could have been switched to nonpetroleum sources.

Natural gas registered the largest absolute amount of total switchable consumption. Of the 4.7 quadrillion Btu total of natural gas consumption, 2.0 quadrillion Btu (42 percent) could have been switched to other sources. Of the 1.8 quadrillion Btu of coal and coke consumed, 0.5 quadrillion Btu (30 percent) were switchable. Very little of the 2.2 quadrillion Btu of purchased electricity consumed by manufacturers in 1985 could have been switched to other sources—less than 2 percent if manufacturing output were to be maintained.

Trends in Industrial Energy Consumption

Energy consumption by the industrial sector increased throughout the 1960's and attained an all-time high in 1973 of 26 quadrillion Btu (11). After 1973, increasing energy prices tended to depress industrial sector demand for energy, and the rate of consumption trended downward. By 1986, the annual total was 20 quadrillion Btu. Following the 1986 fall in crude oil prices, industrial energy consumption rose to 22 quadrillion Btu in 1988.

The industrial sector relied on the three major fossil fuels—petroleum, natural gas, and coal—and electricity throughout the 1960-to-1988 period, but the relative contributions of each form of energy changed over time. Coal, which accounted for a 26-percent share in 1960, provided only 13 percent of industrial energy in 1988. Meanwhile, electricity's share rose from 7 percent to 14 percent.

During the 29-year period, the share supplied by petroleum ranged from 33 percent to 41 percent, and the share supplied by natural gas ranged from 33 percent to 42 percent. In 1988, petroleum's share was the largest, 38 percent, followed by natural gas, 35 percent, electricity, 14 percent, and coal, 13 percent.

One measure of energy efficiency in the industrial sector is the ratio of end-use energy consumption to industrial output (measured in thousand Btu per constant 1982 dollar). Throughout the 1960-to-1973 period, when energy was relatively cheap and supplies were assured, energy consumption per dollar of industrial output stayed within a narrow range, with a low of 11.5 in 1968 and a high of 12.4 in 1970 (12). After 1973, the measure began to decline, and by 1985 (the most recent year for which data are available) had fallen to 8.7 thousand Btu per constant dollar of industrial output, 29 percent below the peak in 1970.

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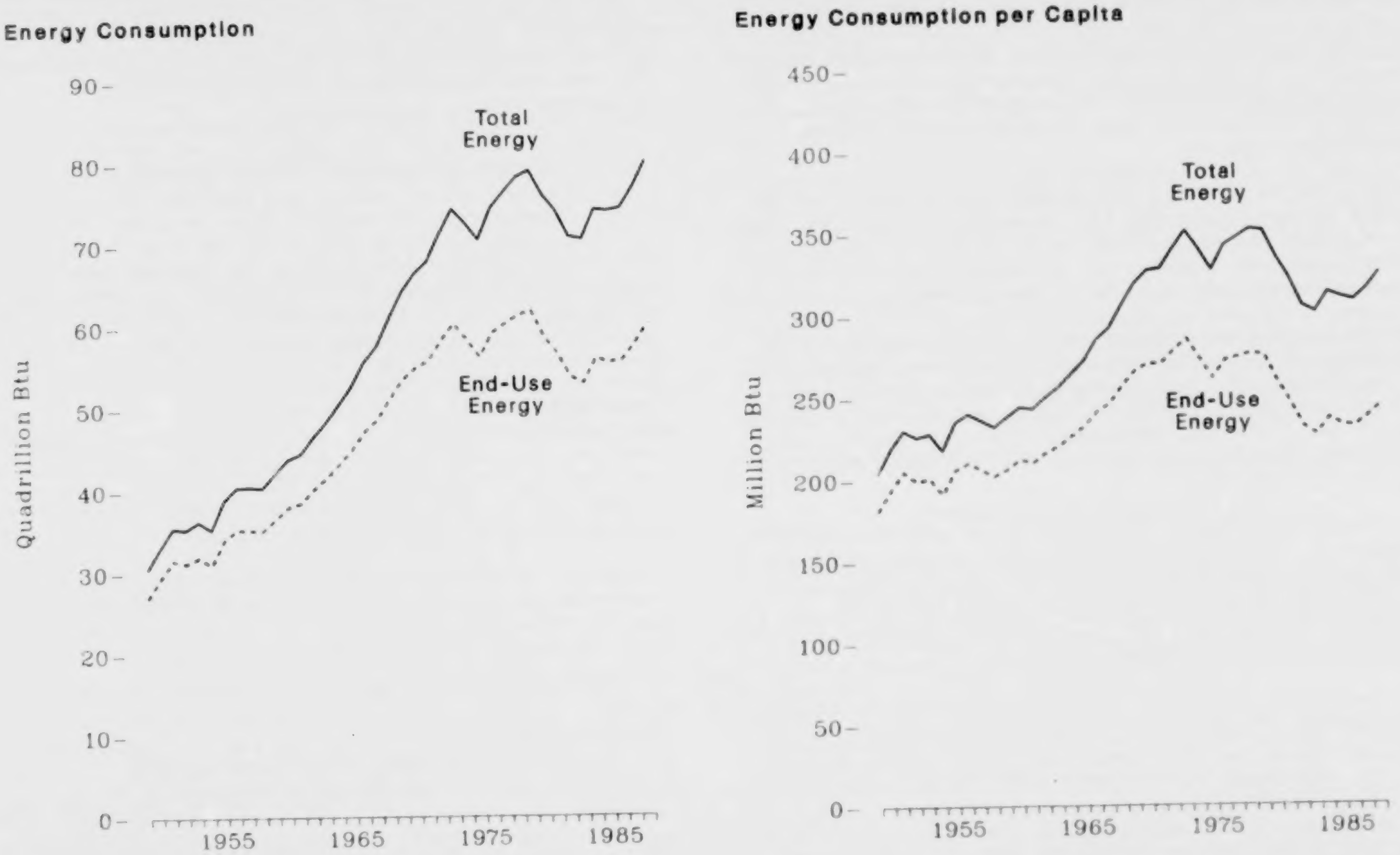
[3] The manufacturing sector is composed of establishments that use mechanical or chemical processes to transform raw materials into intermediate or final products. It does not include the remainder of the industrial sector (construction, mining, agricultural, fishing, and forestry establishments) or electric utilities. The 17.5 quadrillion Btu total is *primary energy consumption*; it includes petrochemical feedstocks and raw material inputs but excludes byproduct fuels.

[4] Net electricity, which is obtained by summing purchases, transfers in, and generation from noncombustible renewable resources, minus quantities sold and transferred out. It excludes electricity generated from combustible fuels, which are counted as generating fuels.

[5] The capability of U.S. manufacturers to switch fuels within 30 days, using only existing equipment and keeping production output constant.

Figure 7. Energy Consumption and Energy Consumption Per Capita, 1949-1988



Source: See Table 7.

Table 7. Energy Consumption and Energy Consumption per Capita, 1949-1988

				Consumption per Capita			
				Total Energy		End-Use Energy	
Year	Total Energy Consumption (quadrillion Btu)	End-Use Energy Consumption (quadrillion Btu)	Population (million)[1]	Quantity (million Btu)	Change from Previous Year (percent)[2]	Quantity (million Btu)	Change from Previous Year (percent)[2]
1949	30.46	26.97	149.3	204	—	181	—
1950	33.08	29.37	151.3	219	7.4	194	7.2
1951	35.47	31.50	154.0	230	5.0	205	5.7
1952	35.30	31.16	156.4	226	-1.7	199	-2.9
1953	36.27	31.87	159.0	228	0.9	201	1.0
1954	35.27	30.92	161.9	218	-4.4	191	-5.0
1955	38.82	34.02	165.1	235	7.8	206	7.9
1956	40.38	35.26	168.1	240	2.1	210	1.9
1957	40.48	35.19	171.2	236	-1.7	206	-1.9
1958	40.35	35.13	174.1	232	-1.7	202	-1.9
1959	42.14	36.53	177.1	238	2.6	206	2.0
1960	43.80	37.96	179.3	244	2.5	212	2.9
1961	44.46	38.46	183.0	243	-0.4	210	-0.9
1962	46.53	40.15	185.8	250	2.9	216	2.9
1963	48.32	41.54	188.5	256	2.4	220	1.9
1964	50.50	43.22	191.1	264	3.1	226	2.7
1965	52.68	44.93	193.5	272	3.0	232	2.7
1966	55.66	47.20	195.6	285	4.8	241	3.9
1967	57.57	48.62	197.5	292	2.5	246	2.1
1968	61.00	51.22	199.4	306	4.8	257	4.5
1969	64.19	53.49	201.4	319	4.2	266	3.5
1970	66.43	54.91	203.2	327	2.5	270	1.5
1971	67.89	55.75	206.8	328	0.3	270	0.0
1972	71.26	58.18	209.3	340	3.7	278	3.0
1973	74.28	60.27	211.4	351	3.2	285	2.5
1974	72.54	58.34	213.3	340	-3.1	273	-4.2
1975	70.55	56.16	215.5	327	-3.8	261	-4.4
1976	74.36	59.12	217.6	342	4.6	272	4.2
1977	76.29	60.22	219.8	347	1.5	274	0.7
1978	78.09	61.25	222.1	352	1.4	276	0.7
1979	78.90	61.84	224.6	351	-0.3	275	-0.4
1980	75.96	58.60	226.5	335	-4.6	259	-5.8
1981	73.99	56.56	229.6	322	-3.9	246	-5.0
1982	70.85	53.70	232.0	305	-5.3	231	-6.1
1983	70.52	52.91	234.3	301	-1.3	226	-2.2
1984	74.10	55.92	236.5	313	4.0	236	4.4
1985	73.95	55.40	238.7	310	-1.0	232	-1.7
1986	74.24	55.62	241.1	308	-0.6	231	-0.4
1987	76.77	57.60	243.4	315	2.3	237	2.6
1988[3]	79.94	60.08	245.8	325	3.2	244	3.0

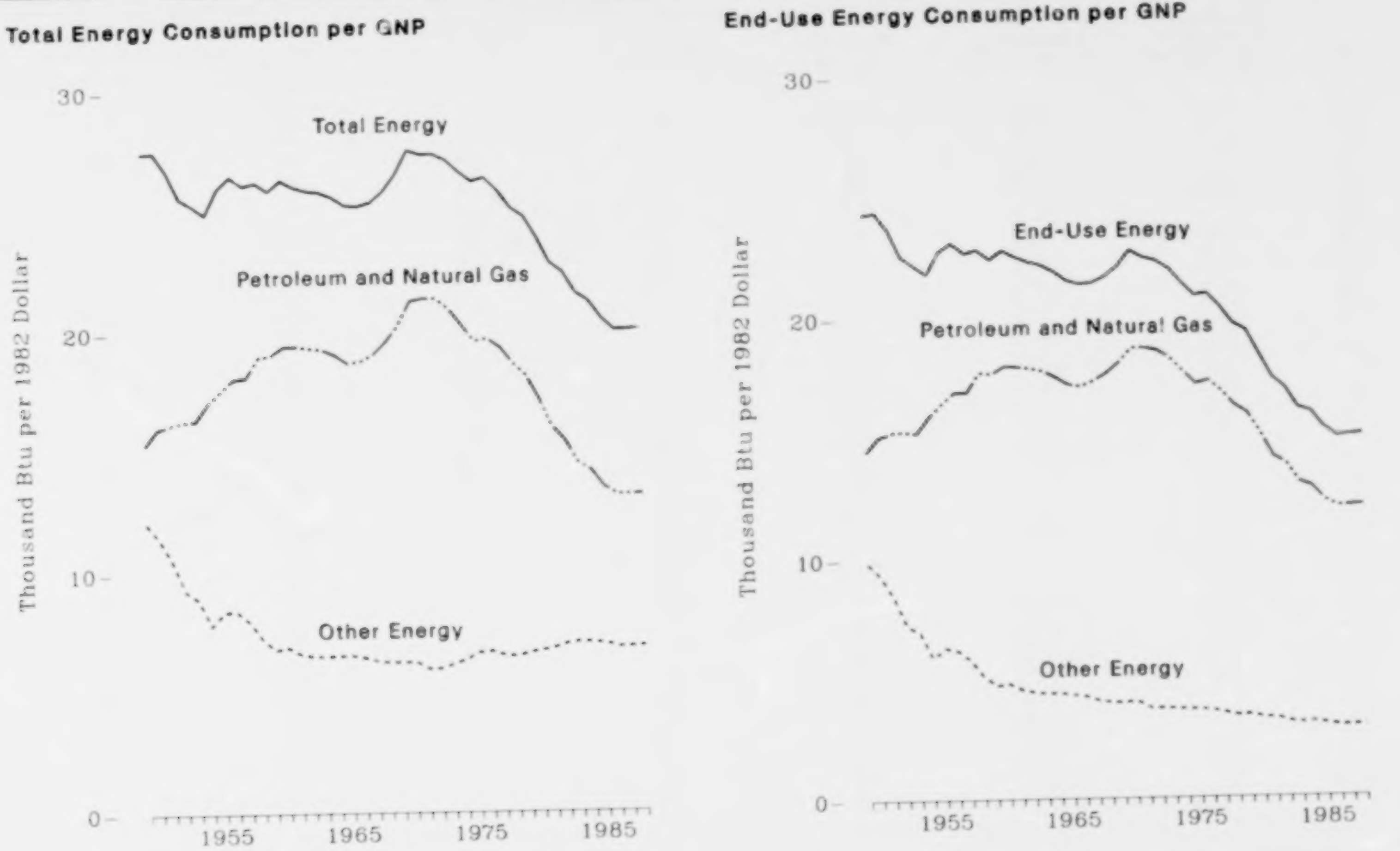
[1] Resident population of the 50 States and the District of Columbia estimated for July 1 of each year, except for the April 1 census count in 1950, 1960, 1970, and 1980.

[2] Percent change calculated from data prior to rounding.

[3] Preliminary.

Sources: **Total Energy Consumption:** Table 3. **End-Use Energy Consumption:** Tables 3 and 87. **Population:** Bureau of the Census, *Current Population Reports*, "Population Estimates and Projections," Series P-25, No. 990, July 1986. **Consumption per Capita:** Calculated by Energy Information Administration.

Figure 8. Total Energy and End-Use Energy Consumption per Constant Dollar of Gross National Product, 1949–1988



Source: See Table 8.

Table 8. Total Energy and End-Use Energy Consumption per Constant Dollar of Gross National Product, 1949-1988

	Total Energy Consumption per GNP[1] (thousand Btu per 1982 dollar, except as shown)				End-Use Energy Consumption[2] per GNP[1] (thousand Btu per 1982 dollar, except as shown)			
			Total				Total	
Year	Petroleum and Natural Gas	Other Energy	Quantity	Percent Change[3]	Petroleum and Natural Gas[4]	Other Energy[5]	Quantity	Percent Change[3]
1949	15.35	12.11	27.46	—	14.47	9.85	24.32	—
1950	16.02	11.46	27.48	0.1	15.09	9.32	24.40	0.3
1951	16.17	10.53	26.70	-2.8	15.27	8.44	23.72	-2.8
1952	16.31	9.27	25.58	-4.2	15.32	7.26	22.58	-4.8
1953	16.35	8.92	25.27	-1.2	15.24	6.96	22.21	-1.6
1954	17.07	7.84	24.90	-1.5	15.92	5.91	21.83	-1.7
1955	17.56	8.41	25.97	4.3	16.45	6.31	22.76	4.3
1956	18.06	8.41	26.47	1.9	16.92	6.19	23.11	1.5
1957	18.13	7.97	26.10	-1.4	16.92	5.77	22.69	-1.8
1958	18.96	7.25	26.21	0.4	17.73	5.10	22.82	0.6
1959	19.05	6.81	25.87	-1.3	17.68	4.74	22.42	-1.8
1960	19.40	6.90	26.30	1.7	17.99	4.80	22.79	1.7
1961	19.40	6.62	26.02	-1.1	17.96	4.54	22.51	-1.2
1962	19.33	6.53	25.86	-0.6	17.89	4.43	22.31	-0.9
1963	19.27	6.52	25.80	-0.2	17.78	4.39	22.17	-0.6
1964	19.05	6.54	25.59	-0.8	17.51	4.39	21.90	-1.2
1965	18.69	6.55	25.24	-1.4	17.20	4.32	21.52	-1.7
1966	18.75	6.46	25.20	-0.2	17.12	4.25	21.37	-0.7
1967	19.03	6.31	25.35	0.6	17.34	4.07	21.41	0.2
1968	19.53	6.26	25.79	1.7	17.65	4.00	21.65	1.1
1969	20.23	6.26	26.49	2.7	18.09	3.98	22.07	1.9
1970	21.24	6.26	27.49	3.8	18.68	4.04	22.72	2.9
1971	21.34	5.98	27.32	-0.6	18.69	3.75	22.44	-1.2
1972	21.33	5.99	27.32	0.0	18.58	3.73	22.30	-0.6
1973	20.90	6.17	27.07	-0.9	18.25	3.71	21.97	-1.5
1974	20.22	6.36	26.58	-1.8	17.70	3.68	21.38	-2.7
1975	19.55	6.63	26.18	-1.5	17.17	3.67	20.84	-2.5
1976	19.64	6.67	26.31	0.5	17.30	3.62	20.91	0.3
1977	19.28	6.50	25.79	-2.0	16.86	3.50	20.36	-2.6
1978	18.61	6.46	25.07	-2.8	16.27	3.39	19.66	-3.4
1979	18.10	6.61	24.71	-1.4	15.94	3.43	19.37	-1.5
1980	17.13	6.70	23.83	-3.6	15.11	3.28	18.39	-5.1
1981	15.96	6.81	22.77	-4.4	14.13	3.28	17.41	-5.3
1982	15.39	6.98	22.38	-1.7	13.84	3.12	16.96	-2.6
1983	14.46	7.05	21.51	-3.9	13.07	3.06	16.13	-4.9
1984	14.15	7.01	21.16	-1.6	12.87	3.10	15.97	-1.0
1985	13.47	6.96	20.43	-3.4	12.30	3.01	15.31	-4.1
1986	13.14	6.81	19.95	-2.3	12.03	2.92	14.94	-2.4
1987	13.14	6.82	19.96	0.1	12.05	2.93	14.97	0.2
1988[6]	13.15	6.85	20.00	0.2	12.08	2.95	15.03	0.4

[1] In 1982 dollars, calculated using implicit GNP price deflators.

[2] End-use energy consumption is total energy consumption less losses incurred in the generation, transmission, and distribution of electricity, less power plant electricity use and unaccounted for electrical system energy losses. (See Glossary).

[3] Percent change calculated from data prior to rounding.

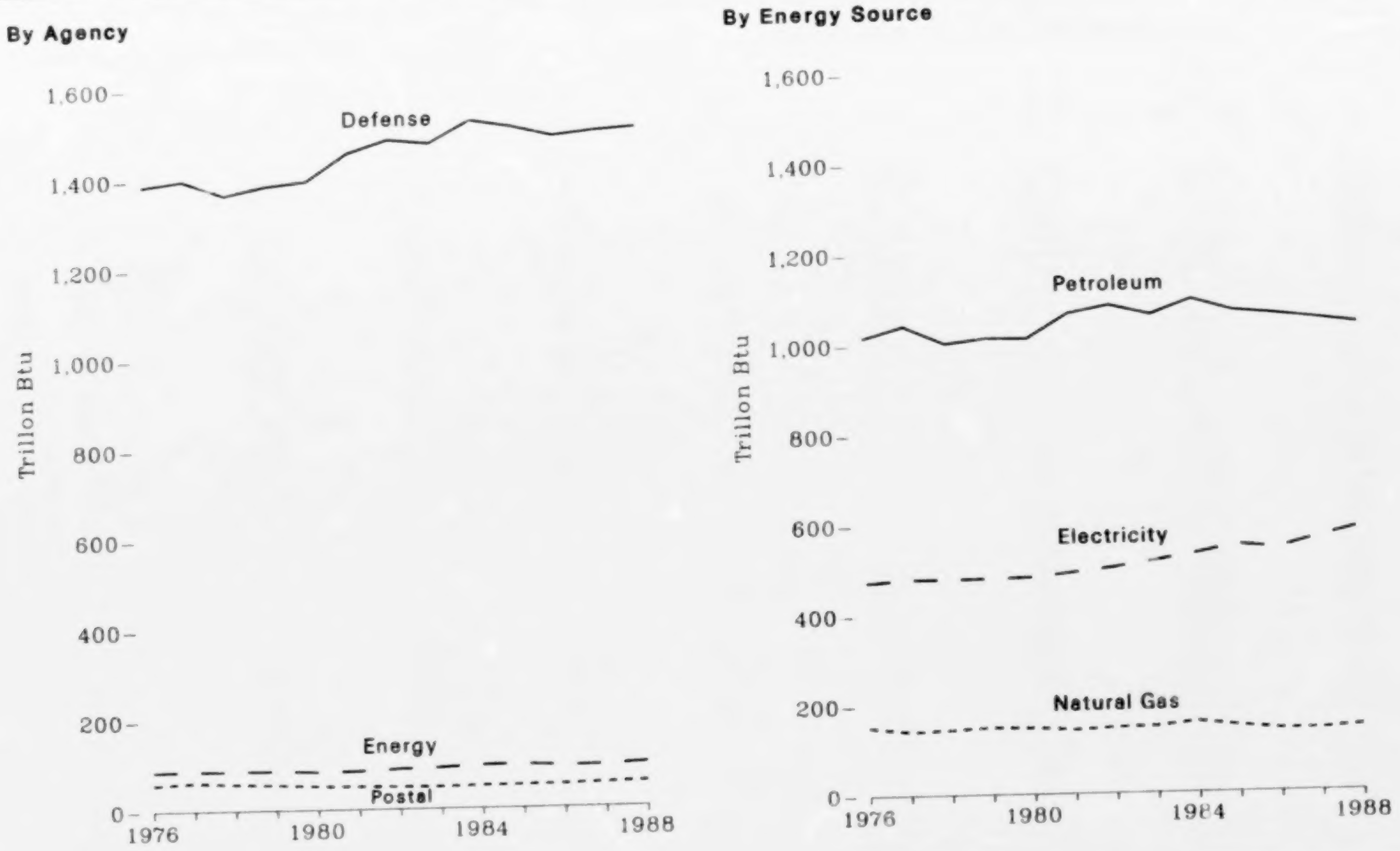
[4] Total petroleum and natural gas consumption less consumption of these fuels by electric utilities.

[5] Total coal consumption less coal consumed at electric utilities, plus electric utility sales, hydroelectric power generated by non-electric utilities, and net imports of coal coke.

[6] Preliminary.

Sources: Tables 3 and 87 and Appendix C.

Figure 9. U.S. Government Energy Use, Fiscal Years 1976–1988



Source: See Table 9.

Table 9. U.S. Government Energy Use, Fiscal Years 1976-1988

(Trillion Btu)

Activity	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988[1]
Agency													
Defense	1,386.8	1,398.4	1,365.7	1,384.6	1,394.8	1,455.4	1,484.3	1,475.1	1,524.1	1,509.6	1,488.1	1,497.8	1,504.1
Energy	87.2	87.9	87.1	86.9	84.0	85.3	89.1	91.3	95.5	96.7	92.0	93.2	97.2
Postal Service	58.3	62.9	58.6	56.0	52.3	50.9	49.4	48.4	50.5	50.9	51.5	53.4	55.8
Veterans Administration	36.5	37.9	39.4	38.5	38.2	37.4	38.0	38.7	40.0	40.6	41.8	42.0	44.4
General Services Administration	41.1	41.1	41.3	40.5	38.9	39.1	38.9	37.8	38.0	35.4	34.1	32.4	30.4
Transportation	27.4	28.8	28.9	27.6	27.6	28.0	28.5	28.7	29.2	29.5	28.1	28.3	26.1
NASA	25.1	24.0	22.4	22.4	21.4	21.2	21.8	22.4	23.0	23.3	24.6	25.1	25.4
Agriculture	11.6	10.8	11.2	11.6	11.2	10.9	10.4	10.4	10.7	10.2	10.6	11.4	11.9
Interior	13.1	13.5	12.3	13.6	11.7	10.7	10.7	10.8	11.8	10.6	10.0	9.7	11.1
Health and Human Services	9.6	9.9	9.6	9.7	9.5	10.6	10.2	10.3	10.8	11.3	10.7	11.2	10.4
Justice	7.1	7.5	7.4	8.1	7.4	7.1	7.7	7.6	8.9	8.1	8.7	8.7	12.8
Other[2]	15.0	15.9	17.1	16.8	16.6	17.1	18.5	17.1	17.7	16.5	16.8	17.1	19.3
Total	1,718.9	1,738.6	1,701.0	1,716.3	1,713.5	1,773.7	1,807.5	1,798.6	1,860.2	1,842.7	1,817.0	1,830.3	1,848.9
Energy Source													
Petroleum													
Motor Gasoline	59.9	60.9	59.6	58.6	56.1	52.9	52.9	51.4	51.0	50.5	45.3	43.5	42.3
Aviation Gasoline	11.6	8.8	6.2	4.7	4.9	4.6	3.6	2.6	1.9	1.9	1.4	0.9	6.0
Jet Fuel	610.0	619.2	601.2	618.6	638.7	653.3	672.7	673.3	693.7	705.6	710.2	702.3	686.5
Distillate and Residual Fuel Oil	329.7	348.5	332.3	327.1	307.8	351.3	349.5	329.4	342.9	305.4	298.0	297.7	298.2
Liquefied Petroleum Gases	4.6	4.1	3.0	3.7	4.0	3.7	3.8	4.0	4.1	4.0	3.9	3.8	3.3
Subtotal	1,015.8	1,041.5	1,002.3	1,012.7	1,011.5	1,065.8	1,082.5	1,060.7	1,093.6	1,067.4	1,058.8	1,048.2	1,036.3
Electricity	473.5	479.7	479.2	479.9	482.2	491.5	501.6	515.2	530.1	548.2	539.8	563.3	584.9
Natural Gas	151.8	141.2	144.7	148.9	147.3	142.2	146.2	147.8	157.4	146.7	138.7	138.0	144.5
Coal	71.3	68.4	66.0	65.1	63.6	65.1	68.6	62.4	65.3	64.0	63.8	60.5	58.3
Purchased Steam	6.3	7.7	8.7	9.7	9.1	9.1	8.6	12.4	13.8	16.4	15.9	19.7	24.8
Total	1,718.9	1,738.6	1,701.0	1,716.3	1,713.5	1,773.7	1,807.5	1,798.6	1,860.2	1,842.7	1,817.0	1,830.3	1,848.9

[1] Preliminary. Energy usage data for Department of Labor, Department of Justice, Department of Defense, and Department of Treasury are estimated.

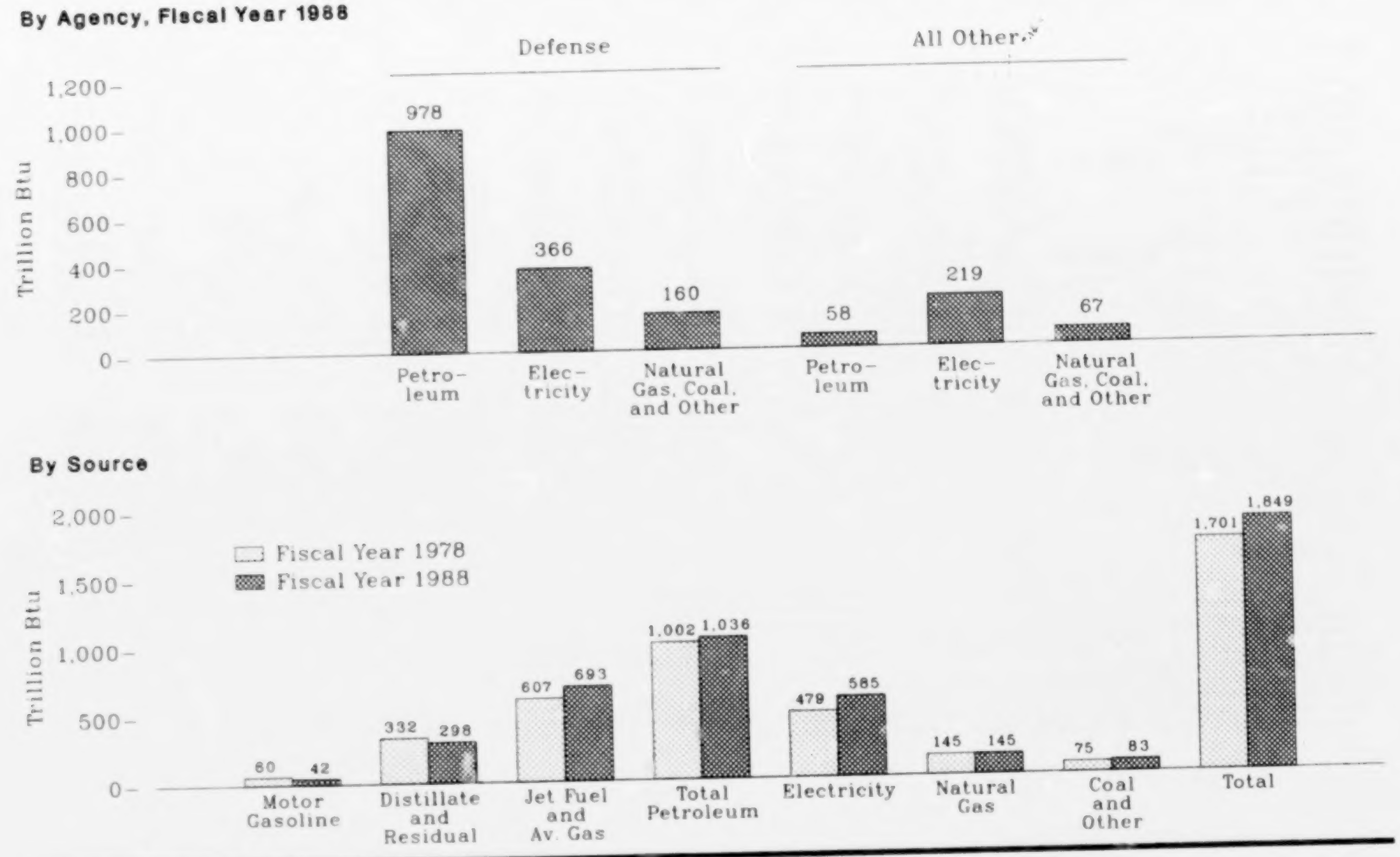
[2] Includes Department of Commerce, Panama Canal Commission, Tennessee Valley Authority, Department of Labor, National Science Foundation, Department of Treasury, Federal Communications Commission, and Environmental Protection Agency. Environmental Protection Agency and the Department of Treasury data for 1982 are estimated. Department of Treasury data for 1983 are estimated.

Note: Sum of components may not equal total due to independent rounding.

Note: These data include energy consumed at foreign installations and in foreign operations, including aviation and ocean bunkering, primarily by the Department of Defense. U.S. Government energy use for electricity generation and uranium enrichment is excluded. However, other energy used by U.S. agencies that produce electricity or enrich uranium is included.

Source: Department of Energy Form DOE 6200.2, "Quarterly Federal Energy Usage Report."

Figure 10. U.S. Government Energy Use by Agency, by Source, Fiscal Years 1978 and 1988



Source: See Table 10.

Table 10. U.S. Government Energy Use by Agency, by Source, Fiscal Years 1978 and 1988

(Trillion Btu)

	Petroleum								
	Motor Gasoline	Distillate and Residual Fuel Oils	Jet Fuel and Aviation Gas	Other [1]	Total	Electricity	Natural Gas	Coal and Other [2]	Total
1978									
Defense	29.8	293.3	599.5	1.9	924.6	293.4	101.5	46.3	1,365.7
Energy	1.4	5.2	0.2	0.2	7.0	52.3	10.2	17.7	87.1
Postal Service	10.7	3.7	0	0.1	14.5	38.7	3.7	1.7	58.6
Veterans Administration	0.6	7.2	0	0	7.7	17.3	12.8	1.6	39.4
General Services Administration	0.2	2.4	0	0	2.5	29.6	4.2	5.0	41.3
Transportation	1.8	8.1	5.7	0.1	15.7	11.7	1.2	0.3	28.9
NASA	0.3	1.4	1.3	0	3.0	15.5	3.0	0.9	22.4
Agriculture	5.3	1.1	0.1	0.2	6.8	3.0	1.4	0	11.2
Interior	3.0	2.5	0.1	0.5	6.1	4.4	1.7	0.1	12.3
Health and Human Services	0.7	2.8	0	0.1	3.6	4.4	1.5	0.1	9.6
Justice	2.0	1.0	0.1	0	3.1	2.1	1.8	0.4	7.4
Other [3]	3.8	3.6	0.2	0.1	7.9	6.8	1.7	0.5	16.9
Total	59.6	332.3	607.3	3.1	1,002.4	479.2	144.7	74.7	1,701.0
1988 [4]									
Defense	18.6	274.2	684.5	0.9	978.2	365.5	102.3	58.0	1,504.1
Energy	1.3	3.1	0.5	0.2	5.1	66.9	6.3	19.0	97.2
Postal Service	9.1	4.3	0	0.2	13.6	36.8	4.7	0.7	55.8
Veterans Administration	0.5	2.6	0	0	3.1	25.7	14.2	1.3	44.4
General Services Administration	0.1	0.6	0	0	0.7	24.7	2.5	2.6	30.4
Transportation	1.7	5.9	5.2	0.1	12.8	12.5	0.8	0	26.1
NASA	0.1	1.0	1.4	0	2.5	19.9	2.7	0.3	25.4
Agriculture	4.0	0.4	0.1	0.2	4.6	5.9	1.3	0	11.9
Interior	2.0	1.4	0.2	0.9	4.5	4.9	0.8	0.2	10.4
Health and Human Services	0.3	2.4	0	0.1	2.8	6.6	1.6	0	11.1
Justice	1.8	0.4	0.1	0.6	2.9	4.9	4.5	0.5	12.8
Other [3]	2.7	2.3	0.7	0	5.5	10.6	2.8	0.3	19.3
Total	42.3	298.2	692.9	3.0	1,036.4	584.9	144.5	83.1	1,848.9

[1] Includes liquefied petroleum gases, and other.

[2] Includes purchased steam, coal, and other.

[3] Includes Department of Commerce, Panama Canal Commission, Tennessee Valley Authority, Department of Labor, National Science Foundation, Department of Treasury, Federal Communications Commission, and Environmental Protection Agency.

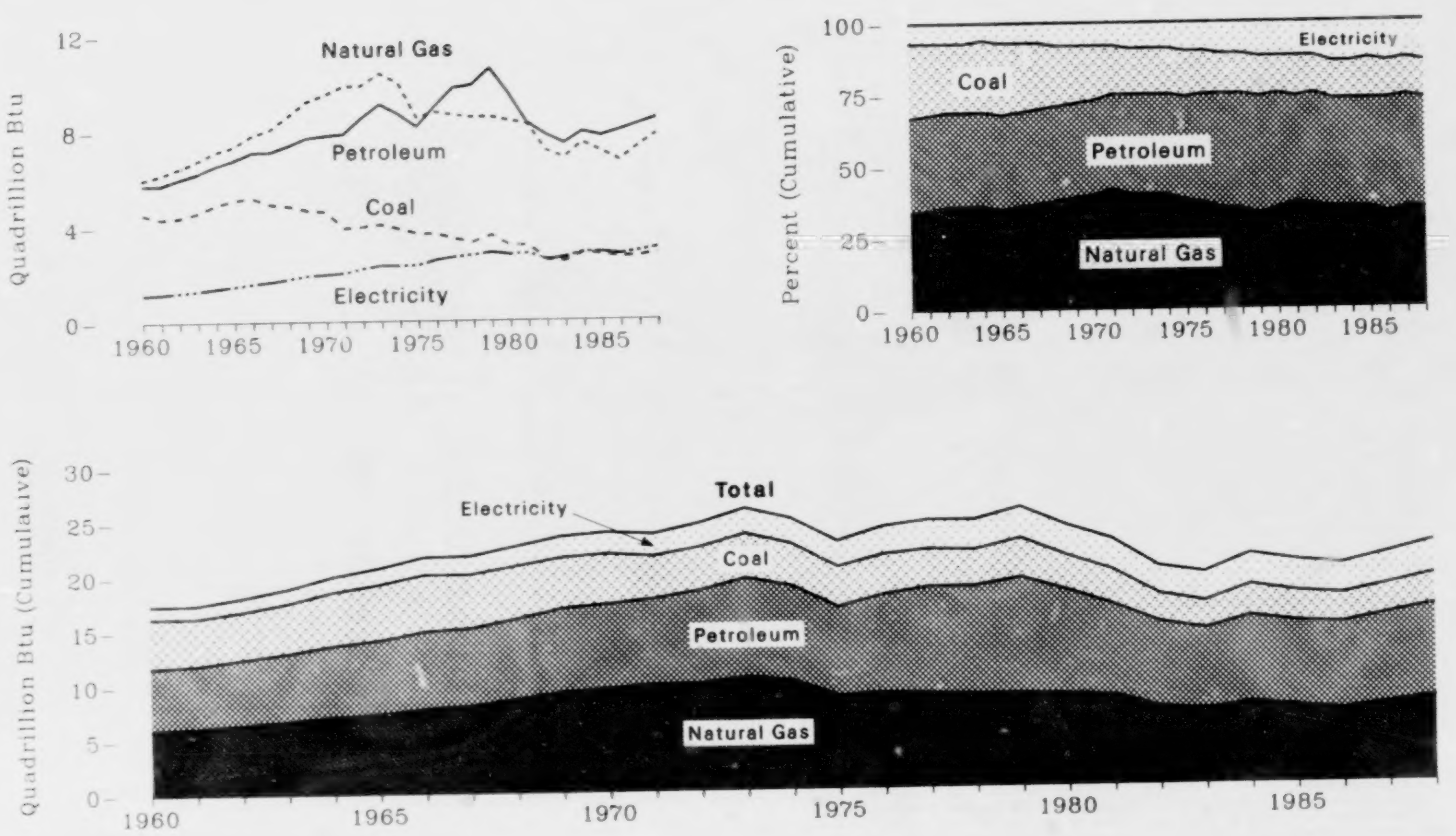
[4] Preliminary. Energy usage data for Department of Defense, Environmental Protection Agency, Health and Human Services, NASA, National Science Foundation, and Department of Treasury are estimated.

Note: Sum of components may not equal total due to independent rounding.

Note: These data include energy consumed at foreign installations and in foreign operations, including aviation and ocean bunkering, primarily by the Department of Defense. U.S. Government energy use for electricity generation and uranium enrichment is excluded. However, other energy used by U.S. agencies that produce electricity or enrich uranium is included.

Source: Department of Energy Form DOE 6200.2, "Quarterly Federal Energy Usage Report."

Figure 11. Industrial Energy Consumption by Source, 1960–1988



Source: See Table 11.

Table 11. Industrial Energy Consumption by Source, 1960-1988

Year	Petroleum Products		Natural Gas		Coal [1]		Electricity [2]		Total [2]
	Quadrillion Btu	Percent	Quadrillion Btu	Percent	Quadrillion Btu	Percent	Quadrillion Btu	Percent	Quadrillion Btu
1960	5.75	33	5.97	34	4.54	26	1.15	7	17.41
1961	5.75	33	6.17	35	4.34	25	1.19	7	17.45
1962	6.00	33	6.45	36	4.39	24	1.26	7	18.10
1963	6.23	33	6.76	36	4.59	24	1.32	7	18.90
1964	6.55	33	7.13	36	4.91	25	1.42	7	20.00
1965	6.79	33	7.35	35	5.12	25	1.50	7	20.75
1966	7.11	33	7.81	36	5.20	24	1.61	7	21.73
1967	7.12	33	8.06	37	4.93	23	1.69	8	21.80
1968	7.39	33	8.62	38	4.85	21	1.81	8	22.67
1969	7.70	33	9.22	39	4.68	20	1.94	8	23.54
1970	7.79	33	9.50	40	4.61	19	1.98	8	23.87
1971	7.86	33	9.85	42	3.92	17	2.04	9	23.67
1972	8.53	35	9.88	40	3.97	16	2.22	9	24.61
1973	9.10	35	10.39	40	4.06	16	2.34	9	25.93
1974	8.69	35	10.00	40	3.87	16	2.33	9	24.89
1975	8.15	36	8.53	38	3.67	16	2.35	10	22.70
1976	9.01	38	8.76	37	3.66	15	2.57	11	24.00
1977	9.77	40	8.64	35	3.45	14	2.68	11	24.54
1978	9.88	40	8.54	35	3.31	14	2.76	11	24.49
1979	10.57	41	8.55	33	3.59	14	2.87	11	25.58
1980	9.53	40	8.39	35	3.16	13	2.78	12	23.86
1981	8.29	37	8.26	37	3.16	14	2.82	13	22.53
1982	7.79	39	7.12	36	2.55	13	2.54	13	20.00
1983	7.42	38	6.82	35	2.49	13	2.65	14	19.38
1984	7.90	38	7.45	35	2.84	13	2.86	14	21.05
1985	7.72	38	7.08	35	2.76	14	2.85	14	20.40
1986	7.94	40	6.69	33	2.64	13	2.76	14	20.02
1987	8.19	39	7.26	35	2.67	13	2.88	14	21.00
1988[3]	8.44	38	7.78	35	2.80	13	3.02	14	22.04

[1] Includes net imports of coal coke.

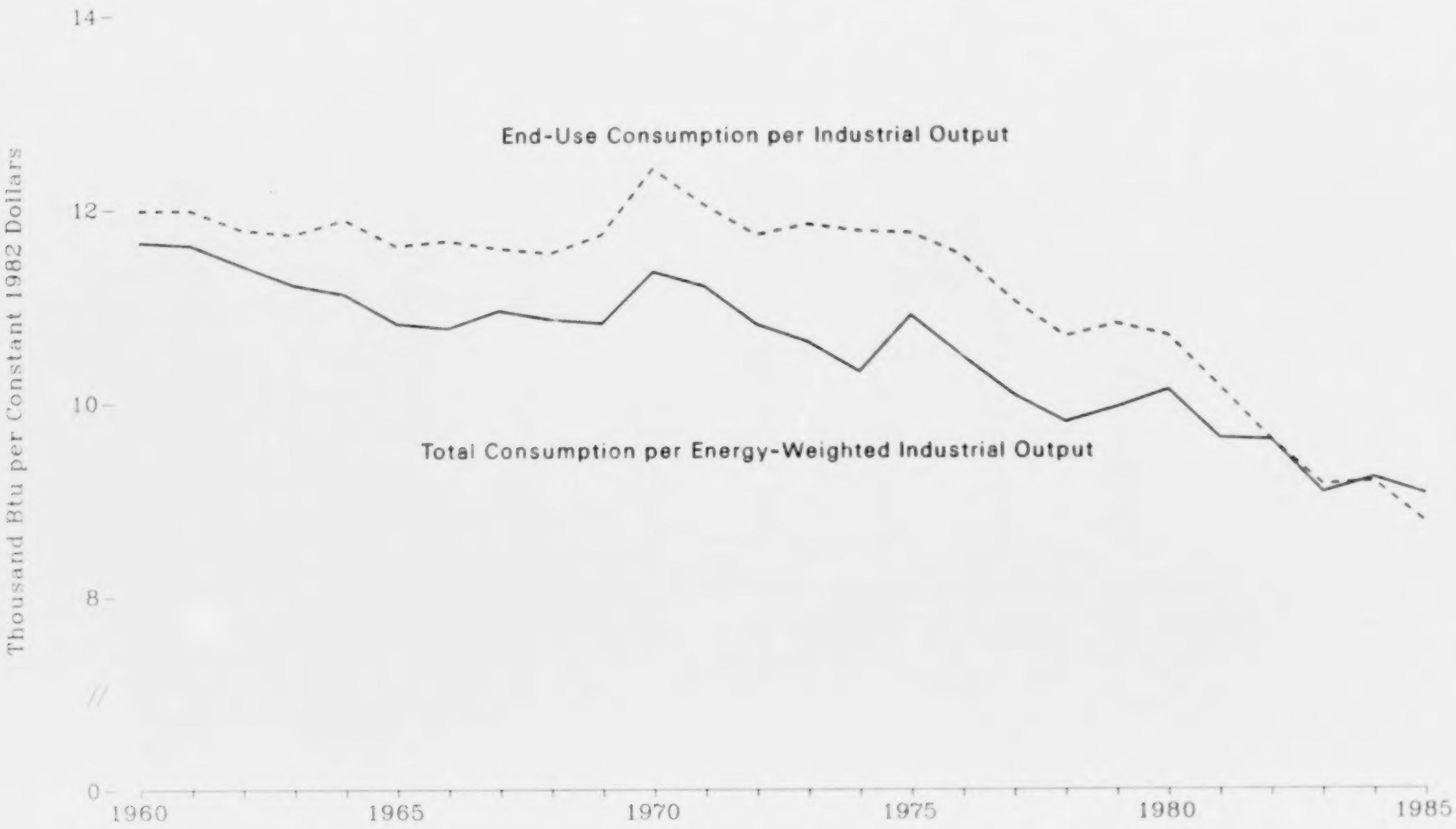
[2] Exludes energy losses from electricity generation, transmission, and distribution. Includes hydroelectric power generated by the industrial sector.

[3] Estimated.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1960 through 1972—Energy Information Administration, "State Energy Data System 1987." •1973 and forward—Energy Information Administration, *Monthly Energy Review* December 1988 (March 1989).

Figure 12. Industrial Energy Consumption per Constant Dollar of Industrial Output, 1960-1985



Source: See Table 12.

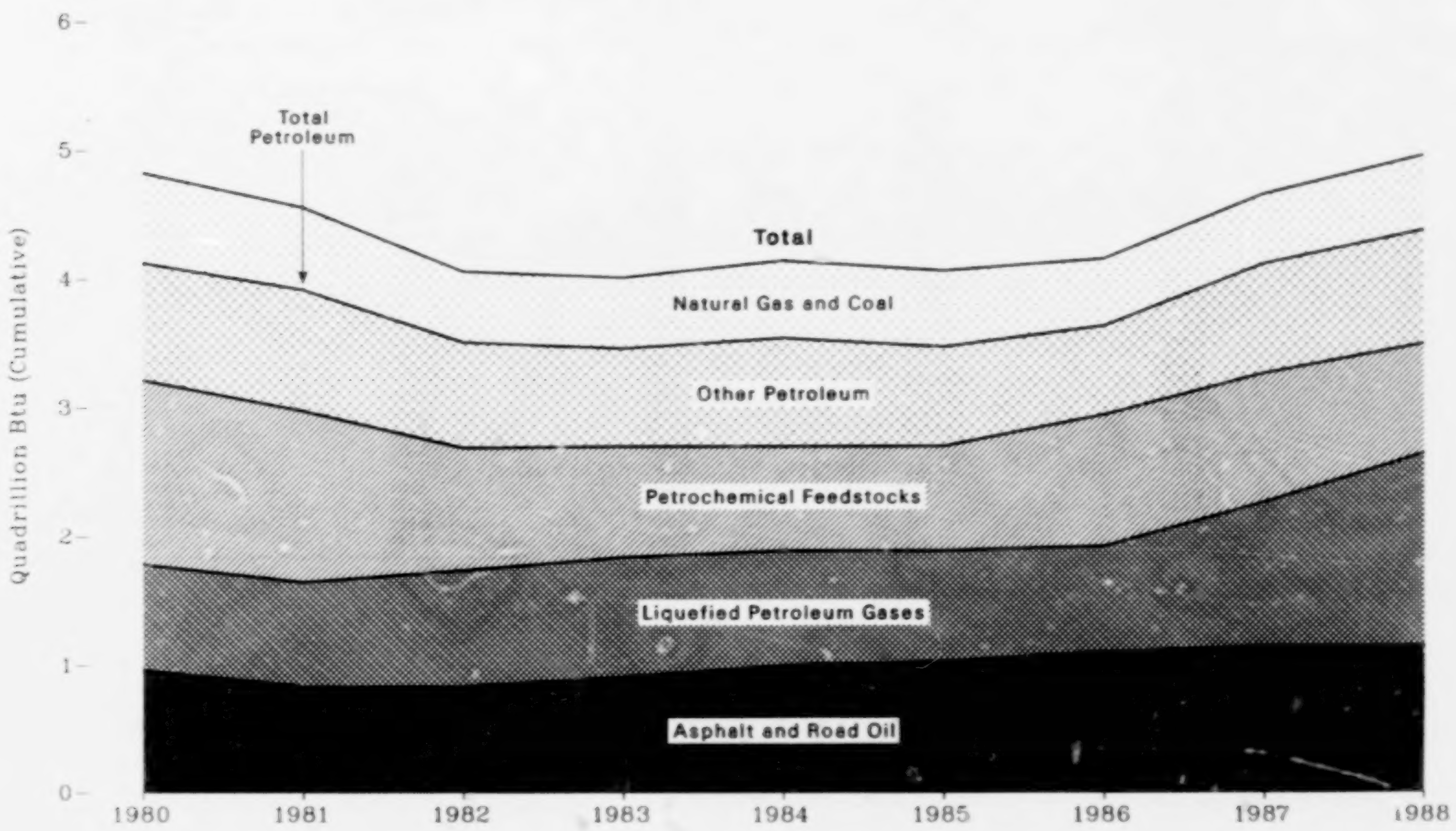
Table 12. Industrial Energy Consumption per Constant Dollar of Industrial Output, 1960-1985

Year	Energy-Weighted Industrial Output [1] (trillion 1982 dollars)	Total Consumption (quadrillion Btu)	Industrial Real Output (trillion 1982 dollars)	End-Use Consumption per Industrial Output (thousand Btu per 1982 dollar)	Total Consumption per Energy-Weighted Industrial Output (thousand Btu per 1982 dollar)
1960	1.731	20.164	1.683	11.981	11.649
1961	1.744	20.256	1.691	11.979	11.615
1962	1.846	21.053	1.788	11.775	11.405
1963	1.961	21.989	1.874	11.734	11.213
1964	2.097	23.296	1.961	11.880	11.109
1965	2.244	24.252	2.089	11.609	10.807
1966	2.375	25.543	2.191	11.658	10.755
1967	2.357	25.773	2.226	11.578	10.935
1968	2.483	26.937	2.337	11.526	10.849
1969	2.601	28.121	2.399	11.722	10.812
1970	2.523	28.610	2.308	12.396	11.340
1971	2.552	28.555	2.374	12.028	11.189
1972	2.767	29.874	2.548	11.724	10.800
1973	2.973	31.579	2.669	11.832	10.622
1974	2.978	30.697	2.610	11.761	10.308
1975	2.612	28.433	2.421	11.744	10.886
1976	2.982	30.268	2.629	11.513	10.466
1977	3.089	31.119	2.820	11.035	10.074
1978	3.213	31.464	2.948	10.673	9.793
1979	3.284	32.641	3.023	10.798	9.939
1980	3.028	30.629	2.868	10.680	10.115
1981	3.041	29.268	2.883	10.152	9.624
1982	2.722	26.135	2.722	9.601	9.601
1983	2.840	25.735	2.816	9.139	9.062
1984	3.013	27.756	3.027	9.169	9.212
1985	2.993	27.056	3.094	8.745	9.040

[1] See Glossary.

Source: Energy Information Administration, *Energy Conservation Indicators 1986 Annual Report* (February 1988).

Figure 13. Nonfuel Use of Fossil Fuels, 1980-1988



Source: See Table 13.

Table 13. Nonfuel Use of Fossil Fuels, 1980-1988

Year	Petroleum Products								Natural Gas	Coal	Total	Percent of Total Energy Consumption
	Asphalt and Road Oil	Liquefied Petroleum Gases	Lubricants	Petro-chemical Feedstock	Petroleum Coke	Special Naphtha	Other[1]	Total				
					Physical Units[2]							
1980	145	231	58	253	16	37	47	788	589	2.9	—	—
1981	125	230	56	236	34	27	43	752	546	2.5	—	—
1982	125	259	51	169	28	25	37	694	491	1.8	—	—
1983	136	267	53	153	15	30	34	688	482	1.5	—	—
1984	149	260	57	144	22	40	27	699	530	1.8	—	—
1985	153	255	53	143	23	30	27	684	520	1.8	—	—
1986	164	268	47	180	21	24	30	734	457	1.8	—	—
1987	170	316	59	170	33	28	29	805	477	1.8	—	—
1988[3]	171	402	57	153	36	25	33	877	515	1.8	—	—
					Quadrillion Btu							
1980	0.96	0.82	0.35	1.43	0.10	0.19	0.27	4.13	0.60	0.10	4.82	6.0
1981	0.83	0.81	0.34	1.33	0.21	0.14	0.25	3.91	0.56	0.08	4.55	6.5
1982	0.83	0.90	0.31	0.95	0.17	0.13	0.21	3.50	0.50	0.05	4.05	5.8
1983	0.90	0.93	0.32	0.86	0.09	0.16	0.19	3.45	0.50	0.05	4.00	5.7
1984	0.99	0.89	0.35	0.81	0.13	0.21	0.15	3.53	0.55	0.05	4.13	5.9
1985	1.02	0.86	0.32	0.81	0.14	0.16	0.15	3.46	0.54	0.05	4.05	5.8
1986	1.09	0.82	0.29	1.02	0.13	0.13	0.14	3.62	0.47	0.05	4.14	5.9
1987	1.13	1.12	0.35	1.00	0.20	0.14	0.16	4.10	0.49	0.05	4.64	5.8
1988[3]	1.13	1.50	0.35	0.85	0.21	0.13	0.19	4.36	0.53	0.05	4.94	6.2

[1] Includes wax and miscellaneous products.

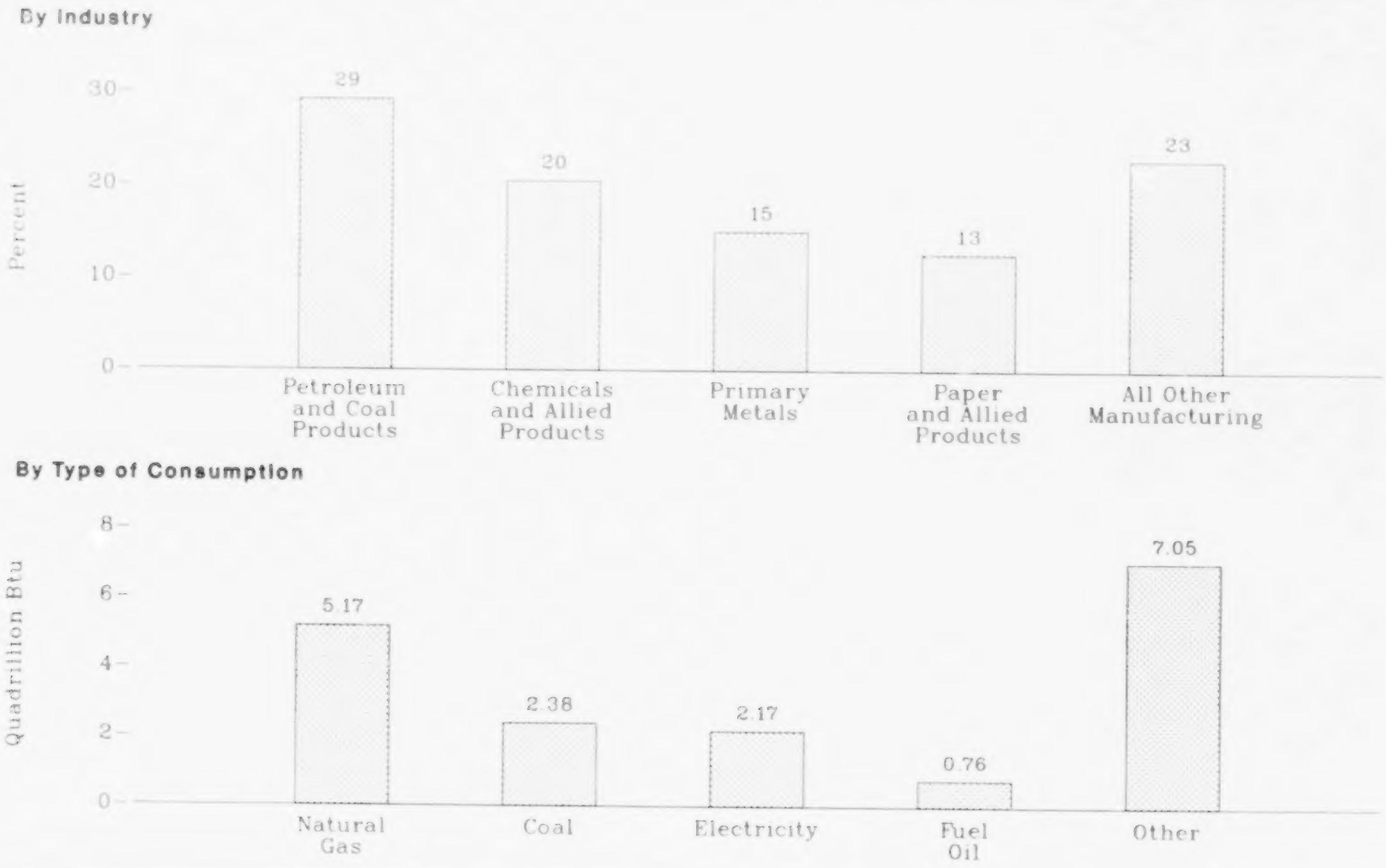
[2] Petroleum - million barrels; natural gas - billion cubic feet; and coal - million short tons.

[3] Preliminary.

— Indicates data not applicable.

Sources: **Petroleum Products:** • 1980—Energy Information Administration, Energy Data Reports, *Petroleum Statement, Annual* and *Sales of Liquefied Petroleum Gases and Ethane in 1980.* •1981 through 1985—Energy Information Administration, *Petroleum Supply Annual* and unpublished data. • 1986 and forward—Energy Information Administration, *Petroleum Supply Monthly* and Energy Information Administration estimates. **Natural Gas:** • 1980— Bureau of the Census, 1980 Survey of Manufactures, *Hydrocarbon, Coal, and Coke Materials Consumed.* • 1981 and forward—Department of Commerce estimates. **Coal:** • 1980—Energy Information Administration, *Coke and Coal Chemicals in 1980.* • 1981—Energy Information Administration, Energy Data Report, *Coke Plant Report,* quarterly. • 1982 and forward—Energy Information Administration, *Quarterly Coal Report* and Energy Information Administration estimates.

Figure 14. Manufacturing Sector Primary Energy Consumption, 1985



Note: "Other" includes all other types of energy that respondents indicated were consumed; included are feedstocks and raw materials for the production of nonenergy products such as asphalt.
Source: See Table 14.

Table 14. Energy Consumption Measures for the Manufacturing Sector, 1985

(Quadrillion Btu, Except as Noted)

Type of Consumption and Selected Industries	Electricity	Fuel Oil	Natural Gas	Coal	Other[1]	Total	Percent
Primary Energy Consumption[2]							
Paper and Allied Products	0.18	0.17	0.41	0.31	1.15	2.21	12.6
Chemicals and Allied Products	0.41	0.13	1.68	0.33	1.02	3.57	20.4
Petroleum and Coal Products	0.11	0.14	0.72	0.01	[3]4.16	5.12	29.2
Primary Metals	0.48	0.05	0.69	1.13	0.27	2.63	15.0
All Other Manufacturing Industries	0.99	0.27	1.67	0.60	0.44	3.99	22.8
Total	2.17	0.76	5.17	2.38	7.05	17.52	100.0
Fuel Consumption to Produce Heat, Power, and Electricity[4]							
Paper and Allied Products	0.17	W	0.40	0.34	W	2.20	16.2
Chemicals and Allied Products	0.40	0.09	1.19	0.35	0.38	2.41	17.7
Petroleum and Coal Products	0.11	0.12	0.72	0.01	1.67	2.63	19.3
Primary Metals	0.47	0.05	0.69	0.09	1.09	2.39	17.5
All Other Manufacturing Industries	0.99	W	1.66	0.64	W	3.99	29.3
Total	2.11	0.69	4.66	1.43	4.73	13.62	100.0
Purchased Fuels and Electricity to Produce Heat, Power, and Electricity							
Paper and Allied Products	0.19	0.17	0.40	0.34	0.28	1.34	13.8
Chemicals and Allied Products	0.43	0.09	1.15	0.33	0.20	2.17	22.4
Petroleum and Coal Products	0.12	0.02	0.70	0.01	0.06	0.92	9.5
Primary Metals	0.48	0.05	0.69	0.09	0.22	1.54	15.9
All Other Manufacturing Industries	1.01	0.26	1.66	0.66	0.09	3.72	38.4
Total	2.23	0.59	4.60	1.42	0.85	9.69	100.0

[1] Includes all other types of energy that respondents indicated were consumed.
[2] Includes feedstocks; does not include byproduct fuels.
[3] Includes feedstocks and raw materials for the production of nonenergy products, such as asphalt, regardless of the type of energy.
[4] Includes byproduct energy.
W = Withheld to avoid disclosing data for individual establishments. Data are included in higher level totals.
Note: Sum of components may not equal total due to independent rounding.
Source: Energy Information Administration, *Manufacturing Energy Consumption Survey: Consumption of Energy, 1985* (November 1988).

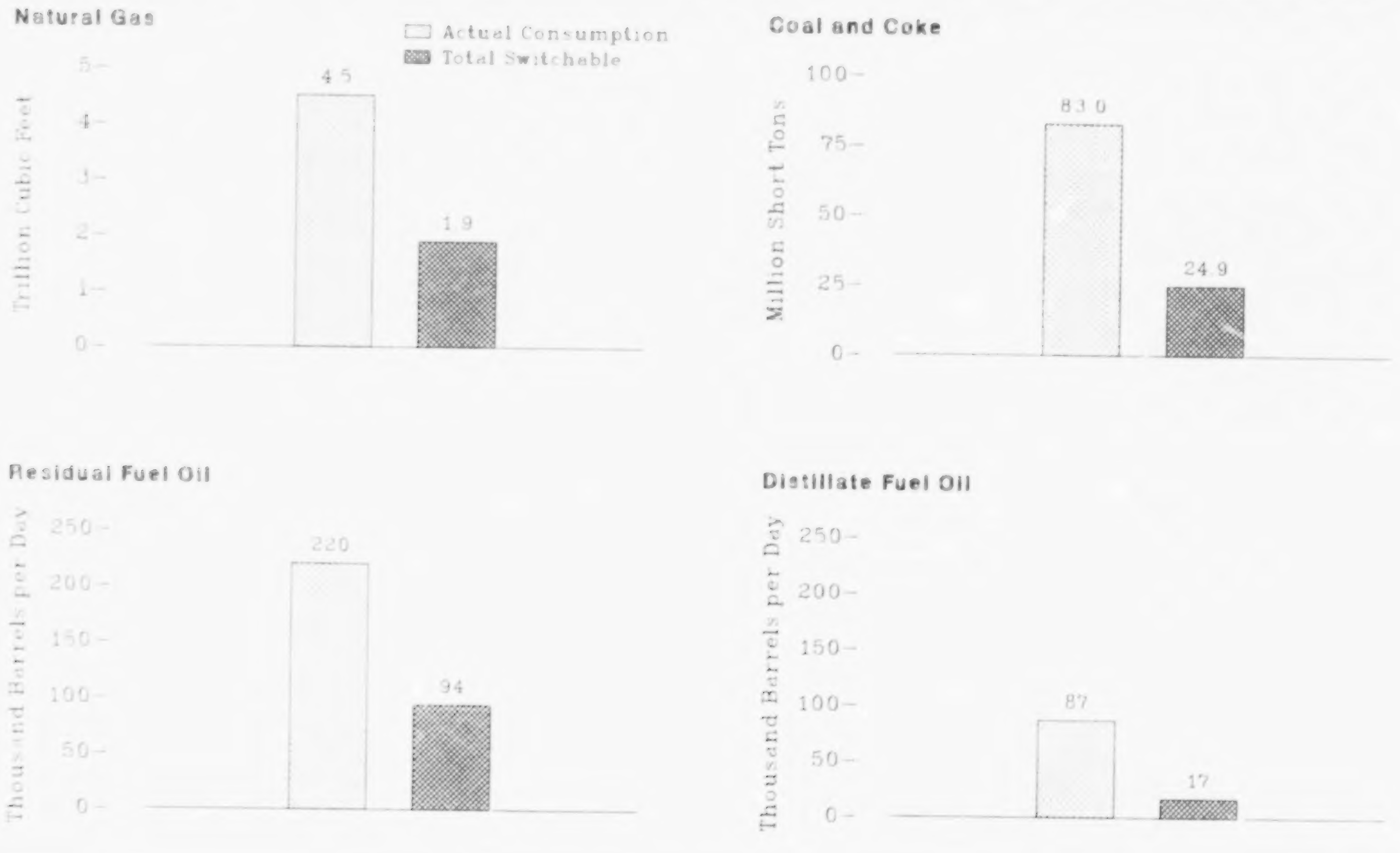


Figure 15. Manufacturing Sector Fuel-Switching Capability Within 30 Days, 1985

Source: See Table 15.

Table 15. Manufacturing Sector Fuel-Switching Capability Within 30 Days, 1985

Measure of Consumption	Natural Gas		Purchased Electricity [1]		Coal and Coke		Residual Fuel Oil		Distillate Fuel Oil	
	Billion Cubic Feet per Year	Quadrillion Btu per Year	Million Kilowatt-hours per Year	Quadrillion Btu per Year	Thousand Short Tons per Year	Quadrillion Btu per Year	Thousand Barrels per Day	Quadrillion Btu per Year	Thousand Barrels per Day	Quadrillion Btu per Year
Actual	4,512	4.656	643,362	2.195	83,003	1.827	220	0.505	87	0.185
Minimum [2]	2,618	2.702	632,733	2.159	58,095	1.279	126	0.290	70	0.148
Maximum [3]	5,071	5.233	662,344	2.260	85,337	1.878	687	1.577	575	1.224
Total Switchable [4]	1,895	1.956	10,631	0.036	24,907	0.548	[5] 94	0.215	[5] 17	0.036

[1] Those quantities for which payment was made and that were available onsite for consumption.

[2] The amount of fuel actually consumed minus the amount of actual consumption that could have been replaced by other fuels.

[3] The amount of fuel actually consumed plus the amount of additional consumption that could have occurred if all possible switching from other fuels took place.

[4] The amount of actual consumption that could have been replaced by other fuels.

[5] The total estimated quantity of residual and distillate fuel oil combined that is switchable to nonpetroleum alternate fuels is 92 thousand barrels per day.

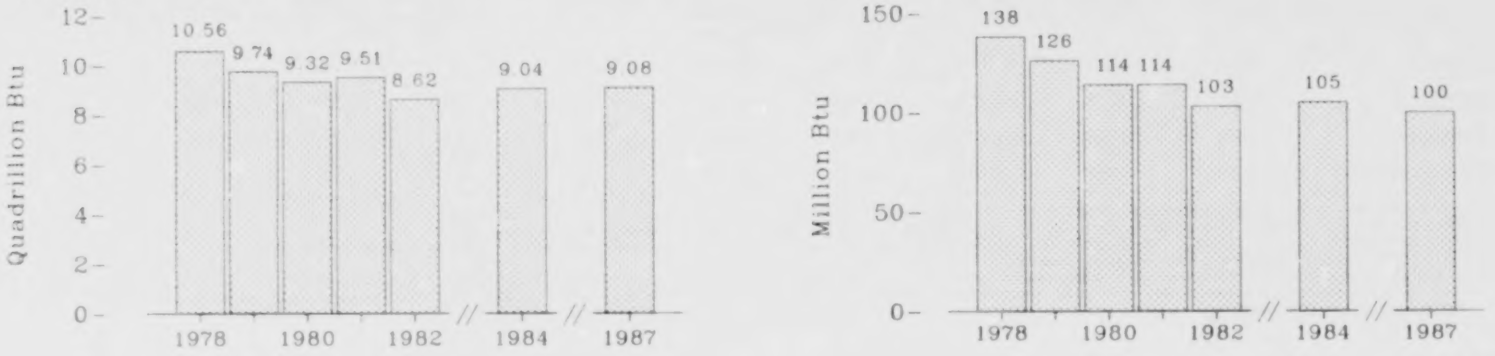
Note: Consumption includes energy consumed for heat, power, and onsite electricity generation. It excludes energy consumed as petrochemical feedstocks and raw material inputs.

Source: Energy Information Administration, *Manufacturing Energy Consumption Survey: Fuel Switching, 1985* (December 1988).

Figure 16. Energy Consumed by Households

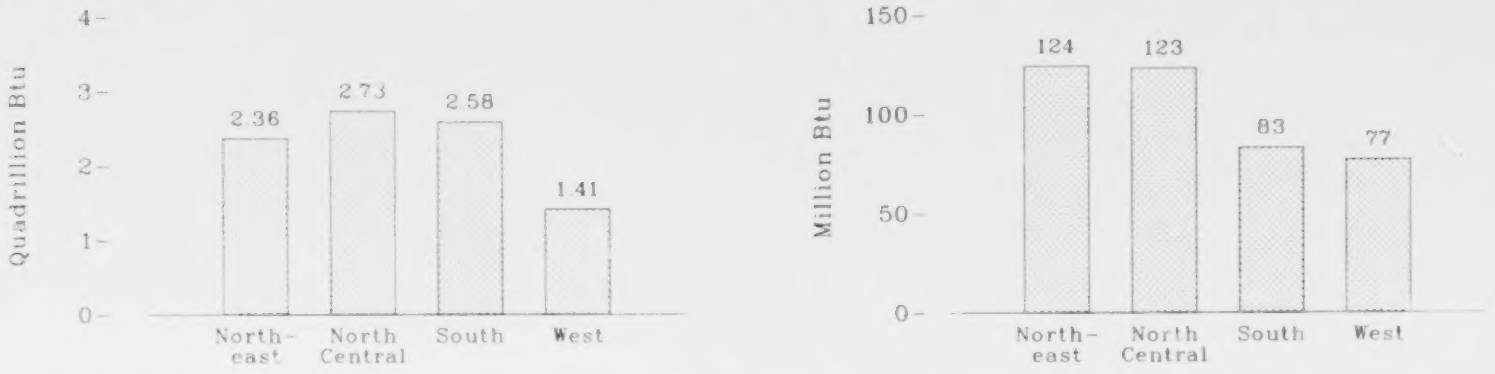
Energy Consumed by Households, 1978-1982, 1984, and 1987

Consumption per Household, 1978-1982, 1984, and 1987



Consumption by All Households by Census Region, 1987

Consumption per Household by Census Region, 1987



Notes: No data are available for 1983, 1985, or 1986. Data for 1987 are preliminary. Data for 1978 through 1984 are for April of year shown through March of following year; data for 1987 are for calendar year.
Source: See Table 16. See Appendix D for Census regions.

Table 16. Energy [1] Consumed by Households by Census Region, 1978-1982, 1984, and 1987

(Quadrillion Btu, Except as Noted)

Census Region [2]	1978	1979	1980	1981	1982	1984	1987 [3]
Northeast							
Natural Gas	1.14	1.05	0.92	1.06	0.99	0.93	1.05
Electricity [4]	0.39	0.39	0.39	0.42	0.38	0.41	0.45
Distillate Fuel Oil and Kerosene	1.32	1.03	1.09	0.96	0.79	0.93	0.85
Liquefied Petroleum Gases	0.03	0.03	0.03	0.03	0.02	0.03	0.02
Total	2.89	2.50	2.43	2.47	2.18	2.29	2.36
Consumption per Household (million Btu)	166	145	138	138	122	125	124
North Central							
Natural Gas	2.53	2.48	2.02	2.24	1.76	1.99	1.84
Electricity [4]	0.60	0.59	0.60	0.57	0.57	0.55	0.61
Distillate Fuel Oil and Kerosene	0.46	0.31	0.16	0.17	0.15	0.13	0.14
Liquefied Petroleum Gases	0.12	0.10	0.15	0.13	0.11	0.13	0.13
Total	3.70	3.48	2.92	3.12	2.60	2.80	2.73
Consumption per Household (million Btu)	180	168	139	147	122	129	123
South							
Natural Gas	0.96	0.91	1.11	1.16	1.13	1.15	1.09
Electricity [4]	1.00	0.97	1.06	1.03	1.05	1.06	1.21
Distillate Fuel Oil and Kerosene	0.32	0.28	0.27	0.16	0.17	0.16	0.16
Liquefied Petroleum Gases	0.15	0.14	0.15	0.12	0.12	0.12	0.11
Total	2.43	2.30	2.59	2.46	2.46	2.50	2.58
Consumption per Household (million Btu)	99	92	96	89	88	85	83
West							
Natural Gas	0.95	0.88	0.89	0.93	0.89	0.91	0.87
Electricity [4]	0.48	0.47	0.41	0.46	0.42	0.47	0.48
Distillate Fuel Oil and Kerosene	0.09	0.09	0.04	0.03	0.03	0.04	0.02
Liquefied Petroleum Gases	0.03	0.04	0.04	0.04	0.04	0.03	0.05
Total	1.54	1.47	1.38	1.47	1.38	1.45	1.41
Consumption per Household (million Btu)	110	100	86	90	84	85	77
United States							
Natural Gas	5.58	5.31	4.94	5.39	4.77	4.98	4.84
Electricity [4]	2.47	2.42	2.46	2.48	2.42	2.48	2.75
Distillate Fuel Oil and Kerosene	2.19	1.71	1.55	1.33	1.14	1.26	1.17
Liquefied Petroleum Gases	0.33	0.31	0.36	0.31	0.29	0.31	0.32
Total	10.56	9.74	9.32	9.51	8.62	9.04	9.08
Consumption per Household (million Btu)	138	126	114	114	103	105	100

[1] Major energy items only, as shown.

[2] See Appendix D for Census regions.

[3] Preliminary.

[4] Includes electricity generated for distribution from wood, waste, geothermal, wind, photovoltaic, and solar thermal energy.

Note: No data are available for 1983, 1985, and 1986.

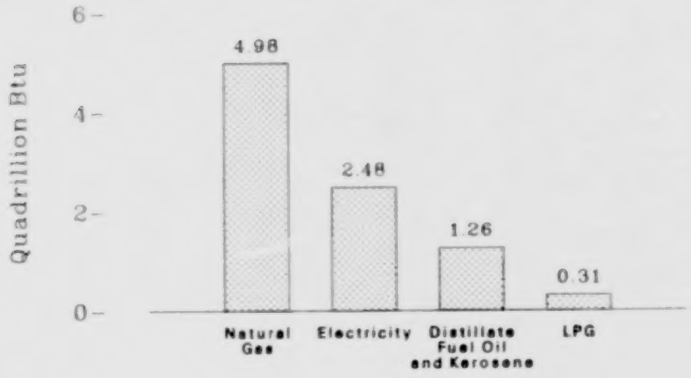
Note: Data for 1978 through 1984 are for April of year shown through March of following year; data for 1987 are for the calendar year.

Note: Sum of components may not equal total due to independent rounding.

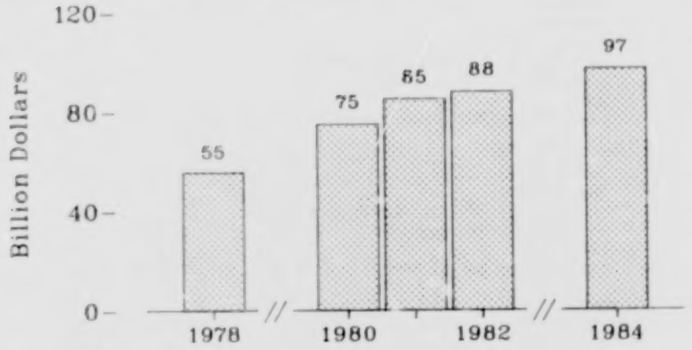
Source: •1978 and 1979—Energy Information Administration, Form EIA-84, "Residential Energy Consumption Survey." •1980 and forward—Energy Information Administration, Form EIA-457, "Residential Energy Consumption Survey."

Figure 17. Household Energy Consumption and Expenditures

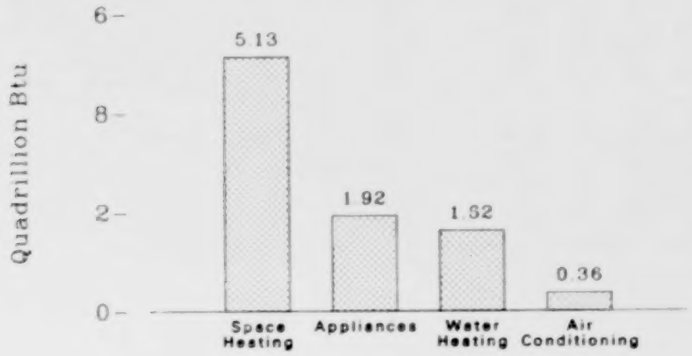
Household Consumption by Source, 1984



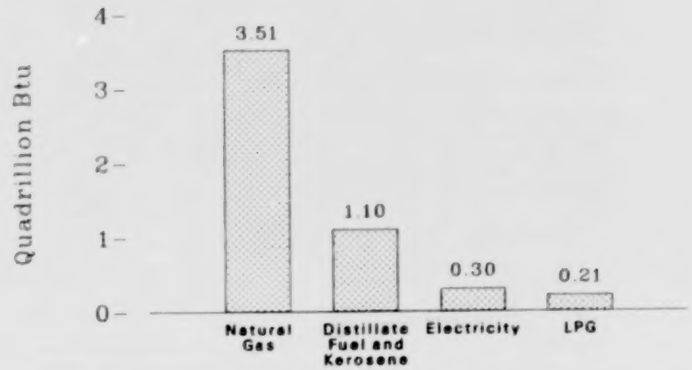
Household Energy Expenditures, 1978, 1980-1982, and 1984



Consumption by Application, 1984



Consumption for Space Heating, 1984



Note: No data are available for 1979 or 1983.
Source: See Table 17.

Table 17. Household Energy Consumption and Expenditures by Application and Fuel Source, 1978, 1980-1982, and 1984

Application and Fuel Source	Consumption (quadrillion Btu)					Expenditures (billion dollars)				
	1978	1980	1981	1982	1984	1978	1980	1981	1982	1984
Space Heating										
Natural Gas	4.26	3.32	3.81	3.31	3.51	11.49	12.80	17.07	18.55	20.66
Electricity [1]	0.41	0.28	0.30	0.27	0.30	3.53	3.71	4.60	4.45	5.71
Distillate Fuel Oil and Kerosene	2.05	1.32	1.13	1.05	1.10	8.06	10.59	9.99	8.84	8.51
Liquefied Petroleum Gases	0.23	0.25	0.22	0.19	0.21	1.05	1.90	1.84	1.68	2.00
Total	6.95	5.17	5.45	4.81	5.13	24.14	29.00	33.49	33.52	36.85
Air Conditioning										
Electricity [1]	0.31	0.32	0.33	0.30	0.36	3.97	5.07	5.96	6.05	7.51
Water Heating										
Natural Gas	1.04	1.24	1.10	1.08	1.10	2.88	4.79	4.93	6.08	6.63
Electricity [1]	0.29	0.31	0.33	0.33	0.32	3.15	4.54	5.32	5.90	6.44
Distillate Fuel Oil and Kerosene	0.14	0.24	0.21	0.09	0.15	0.56	1.89	1.83	0.75	1.09
Liquefied Petroleum Gases	0.06	0.07	0.06	0.06	0.06	0.36	0.59	0.53	0.57	0.58
Total	1.53	1.86	1.69	1.56	1.62	6.94	11.80	12.62	13.30	14.76
Appliances										
Natural Gas	0.28	0.38	0.49	0.39	0.35	0.93	1.71	2.50	2.42	2.31
Electricity [1]	1.46	1.55	1.53	1.52	1.53	19.24	26.82	30.02	32.02	34.95
Liquefied Petroleum Gases	0.03	0.04	0.03	0.04	0.04	0.25	0.41	0.37	0.47	0.54
Total	1.77	1.97	2.05	1.95	1.92	20.42	28.94	32.90	34.91	37.81
Total	10.56	9.32	9.51	8.62	9.04	55.47	74.81	84.96	87.78	97.00
Natural Gas	5.58	4.94	5.39	4.77	4.98	15.30	19.30	24.50	27.06	29.80
Electricity [1]	2.47	2.46	2.48	2.42	2.48	29.89	40.14	45.90	48.42	54.50
Distillate Fuel Oil and Kerosene	2.19	1.55	1.33	1.14	1.26	8.62	12.48	11.82	9.59	9.60
Liquefied Petroleum Gases	0.33	0.36	0.31	0.29	0.31	1.66	2.89	2.74	2.72	3.10

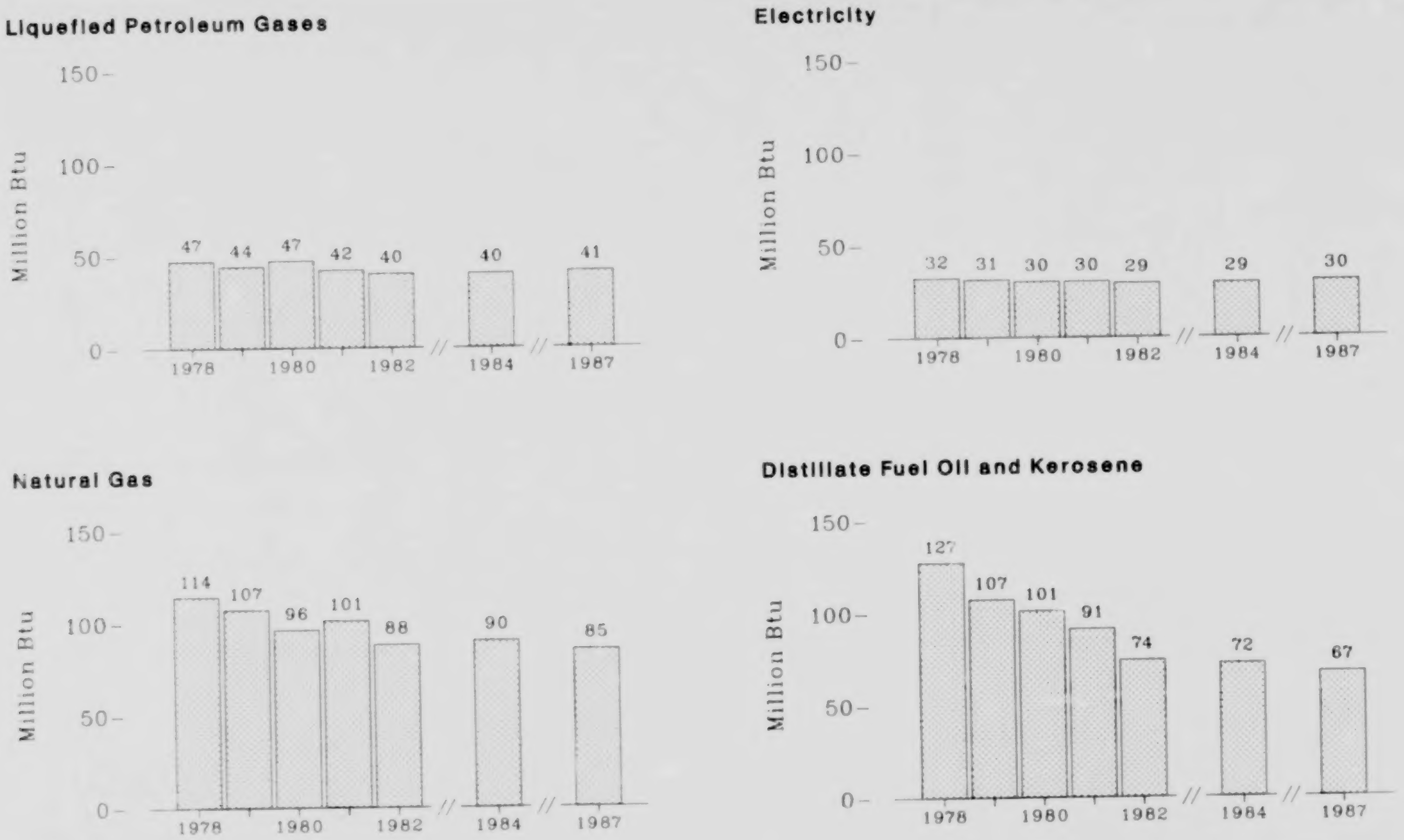
[1] Includes electricity generated for distribution from wood, waste, geothermal, wind, photovoltaic, and solar thermal electricity.

Note: No data are available for 1983. Consumption totals for 1979 are available on Table 16.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1978—Energy Information Administration, Form EIA-84, "Residential Energy Consumption Survey." •1980 and forward—Energy Information Administration, Form EIA-457, "Residential Energy Consumption Survey."

Figure 18. Energy Consumption per Household, by Source, 1978–1982, 1984, and 1987



Notes: No data are available for 1983, 1985, or 1986. Data for 1987 are preliminary. Data for 1978 through 1984 are for April of year shown through March of following year; data for 1987 are for calendar year.
Source: See Table 18.

Table 18. Household Energy Consumption Indicators, 1978-1982, 1984, and 1987

Source	Unit of Measure	1978	1979	1980	1981	1982	1984	1987 [1]
Natural Gas								
Households that use Natural Gas	Million	49.0	49.6	51.6	53.4	54.2	55.4	57.3
Average Consumption per Household	Million Btu	114	107	96	101	88	90	85
Households that use Natural Gas as Main Heating Source	Million	41.8	42.4	44.6	46.2	47.5	47.8	50.0
Average Consumption per Household	Million Btu	128	120	107	112	95	100	93
Heating Degree-Days [2]	Degree-Days	5,207	5,136	4,847	4,988	4,596	4,863	4,282
Heated Floor Space	Square Feet	NA	NA	1,533	1,547	1,483	1,492	1,558
Electricity [3]								
Households that use Electricity	Million	76.6	77.5	81.6	83.1	83.7	86.3	90.5
Average Consumption per Household	Million Btu	32	31	30	30	29	29	30
Households that use Electricity as Main Heating Source and for Air-Conditioning	Million	7.6	8.4	10.7	10.6	10.2	11.4	14.4
Average Consumption per Household	Million Btu	68	59	56	55	57	52	52
Heating Degree-Days [2]	Degree-Days	3,271	3,196	3,543	3,431	3,293	3,051	2,962
Cooling Degree-Days [2]	Degree-Days	1,999	1,714	1,849	1,779	1,647	1,887	2,068
Heated Floor Space	Square Feet	NA	NA	1,398	1,305	1,364	1,324	1,382
Households that use Electricity as Main Heating Source but not for Air-Conditioning	Million	4.5	4.4	3.6	3.7	3.1	3.2	3.5
Average Consumption per Household	Million Btu	72	63	55	50	48	48	40
Heating Degree-Days [2]	Degree-Days	5,862	5,737	5,181	4,913	4,990	5,305	4,247
Heated Floor Space	Square Feet	NA	NA	1,270	1,135	1,068	1,081	1,025
Households that use Electricity for Air-Conditioning but not as Main Heating Source	Million	33.8	33.0	34.3	36.5	37.8	39.5	42.6
Average Consumption per Household	Million Btu	30	30	29	29	28	28	29
Cooling Degree-Days [2]	Degree-Days	1,294	1,008	1,317	1,155	1,062	1,217	1,419
Distillate Fuel Oil and Kerosene (Oil)								
Households that use Oil	Million	17.2	15.9	15.4	14.6	15.5	17.5	17.4
Average Consumption per Household	Million Btu	127	107	101	91	74	72	67
Households that use Oil as Main Heating Source	Million	16.9	14.6	13.4	12.2	12.0	12.2	12.2
Average Consumption per Household	Million Btu	129	113	112	103	90	95	90
Heating Degree-Days [2]	Degree-Days	5,548	5,362	5,827	5,973	5,379	5,360	5,355
Heated Floor Space	Square Feet	NA	NA	1,571	1,573	1,505	1,514	1,614
Liquefied Petroleum Gases (LPG) [4]								
Households that use LPG [4]	Million	6.9	7.0	7.7	7.3	7.3	7.8	7.7
Average Consumption per Household	Million Btu	47	44	47	42	40	40	41
Households that use LPG as Main Heating Source	Million	3.1	3.7	3.7	3.7	3.8	3.9	4.2
Average Consumption per Household	Million Btu	80	67	77	67	59	60	59
Heating Degree-Days [2]	Degree-Days	3,998	3,760	4,386	4,024	3,928	4,262	3,979
Heated Floor Space	Square Feet	NA	NA	1,234	1,288	1,247	1,139	1,311

[1] Preliminary.

[2] Degree-day data for 1987 are from individual weather stations. Data for previous years are from clusters of weather stations.

[3] Includes electricity generated for distribution from wood, waste, geothermal, wind, photovoltaic, and solar thermal energy.

[4] Excludes household use of liquefied petroleum gases for cooking grills or recreation vehicles.

NA = Not available.

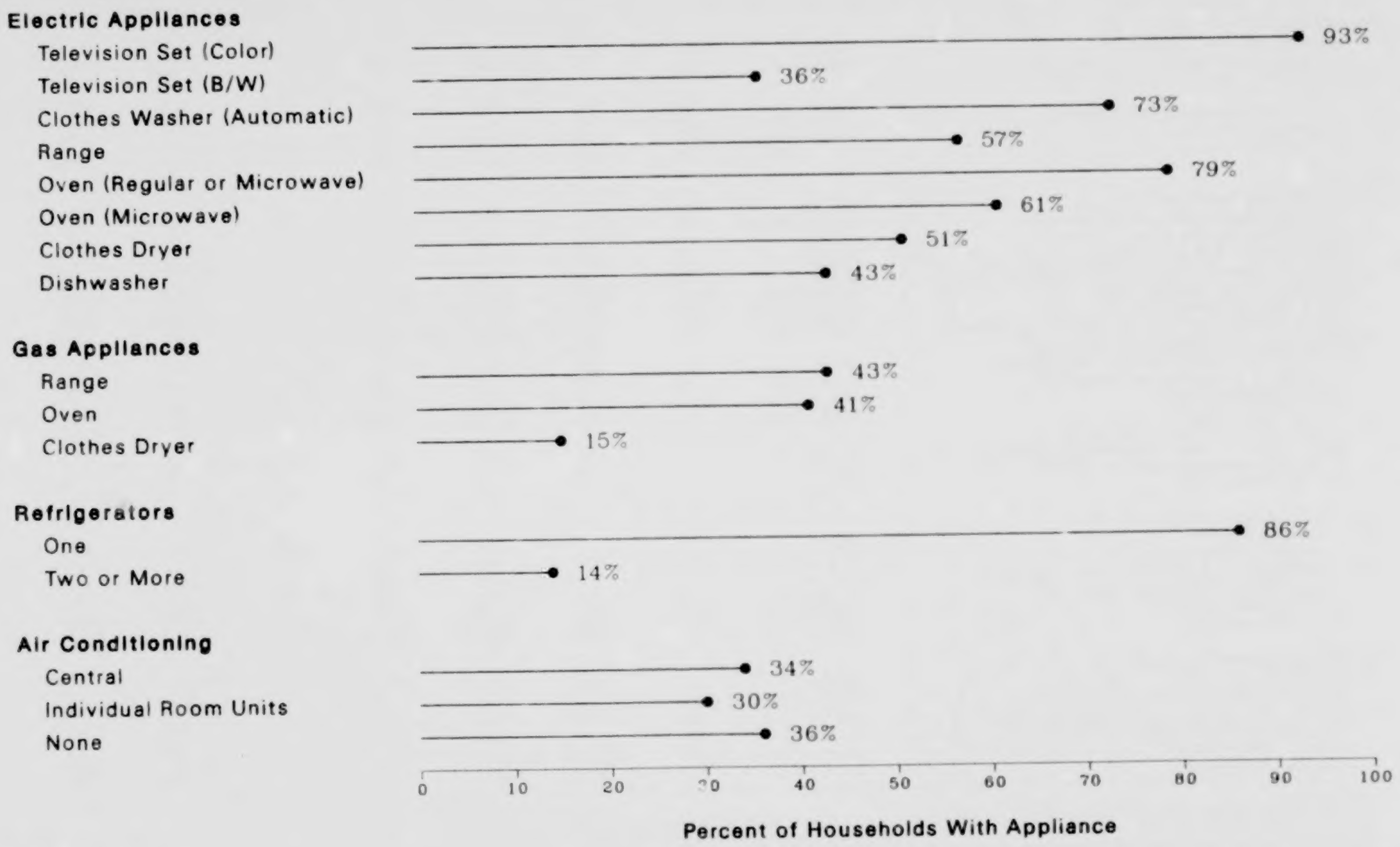
Note: No data are available for 1983, 1985, and 1986.

Note: Data for 1978 through 1984 are for April of year shown through March of following year except for household counts and floor space that are for November of year shown; data for 1987 are for calendar year except for household counts and floor space that are for November 1987.

Note: Average consumption per household for each energy source is total average consumption per household and is not limited to space heating and cooling only.

Sources: •1978 and 1979—Energy Information Administration, Form EIA-84, "Residential Energy Consumption Survey." •1980 and forward—Energy Information Administration, Form EIA-457, "Residential Energy Consumption Survey."

Figure 19. Households With Selected Appliances, 1987



Source: See Table 19.

Table 19. Households With Selected Appliances, 1978-1982, 1984, and 1987

Appliance	Million Households							Percent of Households						
	1978	1979	1980	1981	1982	1984	1987	1978	1979	1980	1981	1982	1984	1987
Total Households	76.6	77.5	81.6	83.1	83.8	86.3	90.5	100	100	100	100	100	100	100
Type Appliances														
Electric Appliances														
Television Set (Color)	NA	NA	67.0	68.4	71.0	75.9	83.9	NA	NA	82	82	85	88	93
Television Set (B/W)	NA	NA	41.9	39.5	38.9	37.3	32.4	NA	NA	51	48	47	43	36
Clothes Washer (Automatic)	54.0	NA	58.4	58.4	57.9	61.1	66.4	71	NA	72	70	69	71	73
Clothes Washer (Wringer)	3.4	NA	2.9	2.8	2.5	2.7	2.4	4	NA	4	3	3	3	3
Range (Stove-Top or Burners)	40.7	NA	43.8	45.2	44.7	46.5	51.4	53	NA	54	54	53	54	57
Oven, Regular or Microwave	41.5	NA	48.5	48.2	49.3	54.2	71.5	54	NA	59	58	59	63	79
Oven, Microwave	6.0	NA	11.6	14.0	17.3	29.6	55.0	8	NA	14	17	21	34	61
Clothes Dryer	34.5	NA	38.3	37.5	37.9	39.6	45.9	45	NA	47	45	45	46	51
Separate Freezer	27.0	NA	21.1	31.9	31.0	31.7	30.8	35	NA	38	38	37	37	34
Dishwasher	26.5	NA	30.4	30.5	30.3	32.5	39.0	35	NA	37	37	36	38	43
Humidifier	NA	NA	11.0	10.8	11.3	11.3	13.2	NA	NA	14	13	14	13	15
Dehumidifier	NA	NA	7.3	7.8	7.5	7.5	9.0	NA	NA	9	9	9	9	10
Window or Ceiling Fan	NA	NA	NA	NA	23.5	30.6	41.8	NA	NA	NA	NA	28	35	46
Whole House Cooling Fan	NA	NA	NA	NA	6.5	6.7	8.6	NA	NA	NA	NA	8	8	9
Evaporative Cooler	NA	NA	3.2	3.0	3.6	3.2	3.0	NA	NA	4	4	4	4	3
Gas Appliances														
Range (Stove-Top or Burners)	36.9	NA	37.5	38.2	39.0	39.0	38.7	48	NA	46	46	47	45	43
Oven	35.9	NA	34.2	33.0	35.0	35.9	37.1	47	NA	42	40	42	42	41
Clothes Dryer	11.0	NA	11.8	13.1	12.2	13.7	13.8	14	NA	14	16	15	16	15
Outdoor Gas Grill	NA	NA	7.1	7.4	9.4	11.5	18.3	NA	NA	9	9	11	13	20
Outdoor Gas Light	1.3	NA	1.6	1.4	1.4	1.2	1.3	2	NA	2	2	2	1	1
Swimming Pool Heater [1]	NA	NA	0.4	0.4	0.3	0.7	1.3	NA	NA	([2])	([2])	([2])	1	1
Refrigerators														
One	66.0	NA	70.0	72.4	72.4	75.8	78.1	86	NA	86	87	86	88	86
Two or More	10.4	NA	11.5	10.5	11.1	10.3	12.3	14	NA	14	13	13	12	14
None	0.2	NA	0.2	0.2	0.2	0.2	0.2	([2])	NA	([2])	([2])	([2])	([2])	([2])
Air Conditioning (A/C)														
Central	17.6	18.7	22.2	22.4	23.3	25.7	30.7	23	24	27	27	28	30	34
Individual Room Units	25.1	23.8	24.5	26.0	25.3	25.8	26.9	33	31	30	31	30	30	30
None	33.8	35.0	34.9	34.7	35.1	34.9	32.9	44	45	43	42	42	40	36

[1] In 1984 and 1987, also includes heaters for jacuzzis and hot tubs.

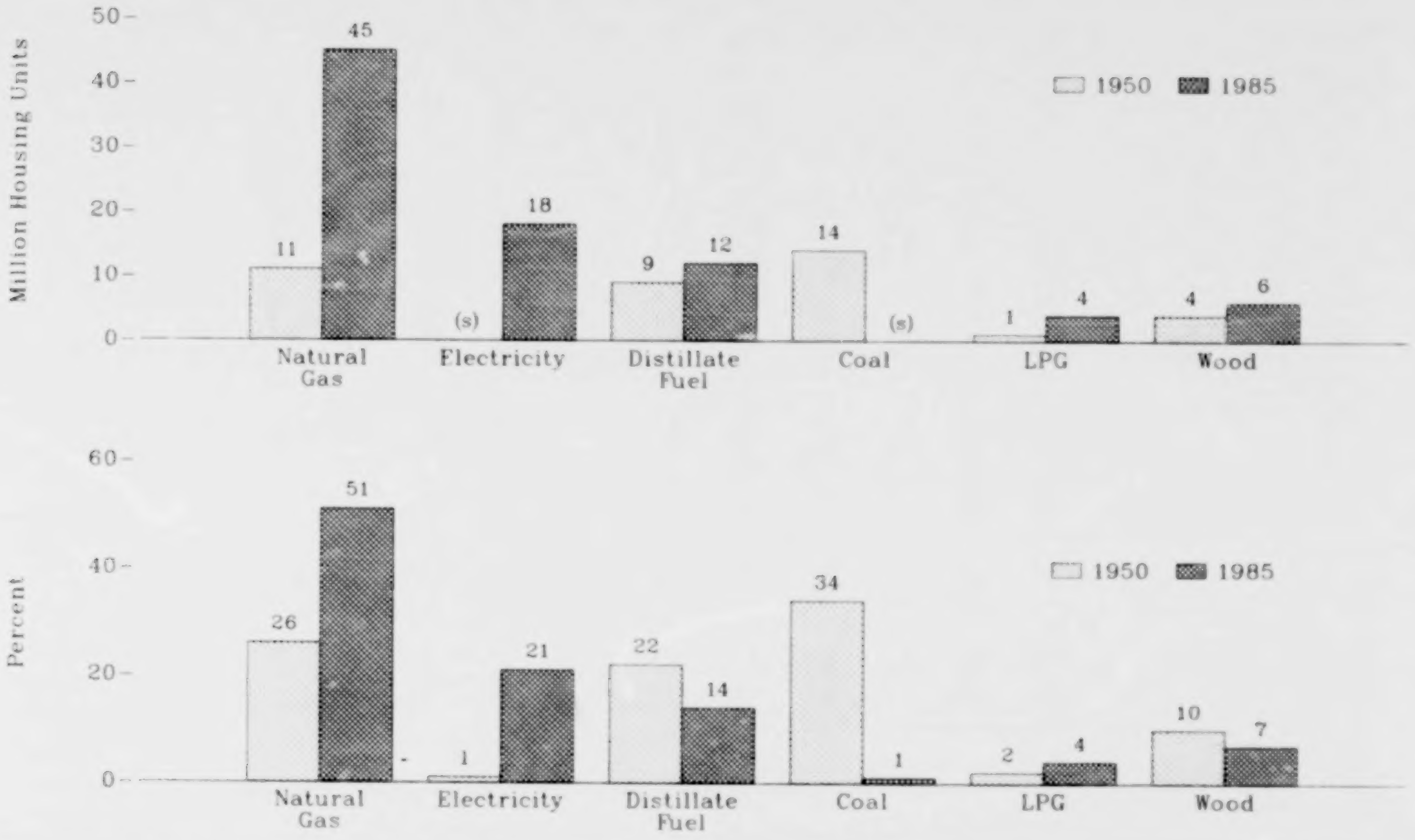
[2] Less than 0.5 percent.

NA = Not available.

Note: No data are available for 1983, 1985, and 1986.

Source: •1978 and 1979—Energy Information Administration, Form EIA-84, "Residential Energy Consumption Survey." •1980 and forward—Energy Information Administration, Form EIA-457, "Residential Energy Consumption Survey."

Figure 20. Type of Heating in Occupied Housing Units, 1950 and 1985



(s) = Less than 0.5.
Source: See Table 20.

Table 20. Type of Heating in Occupied Housing Units,[1] Selected Years, 1950-1985

Year	Coal [2]	Natural Gas	Liquefied Gas	Distillate Fuel Oil	Kerosene	Electricity	Wood	Solar	Other	None [3]	Total
						Million					
1950	14.48	11.12	0.98	9.46	([4])	0.28	4.17	NA	0.77	1.57	42.83
1960	6.46	22.85	2.69	17.16	([4])	0.93	2.24	NA	0.22	0.48	53.02
1970	1.82	35.01	3.81	16.47	([4])	4.88	0.79	NA	0.27	0.40	63.45
1973	0.80	38.46	4.42	17.24	([4])	7.21	0.60	NA	0.15	0.45	69.34
1974	0.74	39.47	4.14	16.84	([4])	8.41	0.66	NA	0.09	0.48	70.83
1975	0.57	40.93	4.15	16.30	([4])	9.17	0.85	NA	0.08	0.47	72.52
1976	0.48	41.22	4.24	16.45	([4])	10.15	0.91	NA	0.09	0.46	74.01
1977	0.45	41.54	4.18	15.62	0.44	11.15	1.24	NA	0.15	0.51	75.28
1978	0.40	42.52	4.13	15.65	0.42	12.26	1.07	NA	0.12	0.60	77.17
1979	0.36	43.32	4.13	15.30	0.41	13.24	1.14	NA	0.10	0.57	78.57
1980	0.33	44.40	4.17	14.50	0.37	14.21	1.38	NA	0.11	0.61	80.07
1981	0.36	46.08	4.17	14.13	0.37	15.49	1.89	NA	0.10	0.59	83.18
1983	0.43	46.70	3.87	12.59	0.45	15.68	4.09	NA	0.16	0.68	84.64
1985[5]	0.45	45.33	3.58	12.44	1.06	18.36	6.25	0.05	0.37	0.53	88.43
						Percent					
1950	33.8	26.0	2.3	22.1	([4])	0.6	9.7	0	1.8	3.7	100.0
1960	12.2	43.1	5.1	32.4	([4])	1.8	4.2	0	0.4	0.9	100.0
1970	2.9	55.2	6.0	26.0	([4])	7.7	1.3	0	0.4	0.6	100.0
1973	1.2	55.5	6.4	24.9	([4])	10.4	0.9	0	0.2	0.7	100.0
1974	1.0	55.7	5.8	23.8	([4])	11.9	0.9	0	0.1	0.7	100.0
1975	0.8	56.4	5.7	22.5	([4])	12.6	1.2	0	0.1	0.6	100.0
1976	0.7	55.7	5.7	22.2	([4])	13.7	1.2	0	0.1	0.6	100.0
1977	0.6	55.2	5.6	20.7	0.6	14.8	1.6	0	0.2	0.7	100.0
1978	0.5	55.1	5.4	20.3	0.5	15.9	1.4	0	0.2	0.8	100.0
1979	0.5	55.1	5.3	19.5	0.5	16.9	1.4	0	0.1	0.7	100.0
1980	0.4	55.4	5.2	18.1	0.5	17.7	1.7	0	0.1	0.8	100.0
1981	0.4	55.4	5.0	17.0	0.4	18.6	2.3	0	0.1	0.7	100.0
1983	0.5	55.2	4.6	14.9	0.5	18.5	4.8	0	0.2	0.8	100.0
1985[5]	0.5	51.3	4.1	14.1	1.2	20.8	7.1	0.1	0.4	0.6	100.0

[1] Includes mobile homes and individual housing units in apartment buildings. Housing units with more than one type of heating system are classified according to the principal type of heating system.

[2] Includes coal coke.

[3] Includes nonreporting units in 1950 and 1960 which totaled 997 and 2,000 units, respectively.

[4] Included in distillate fuel oil.

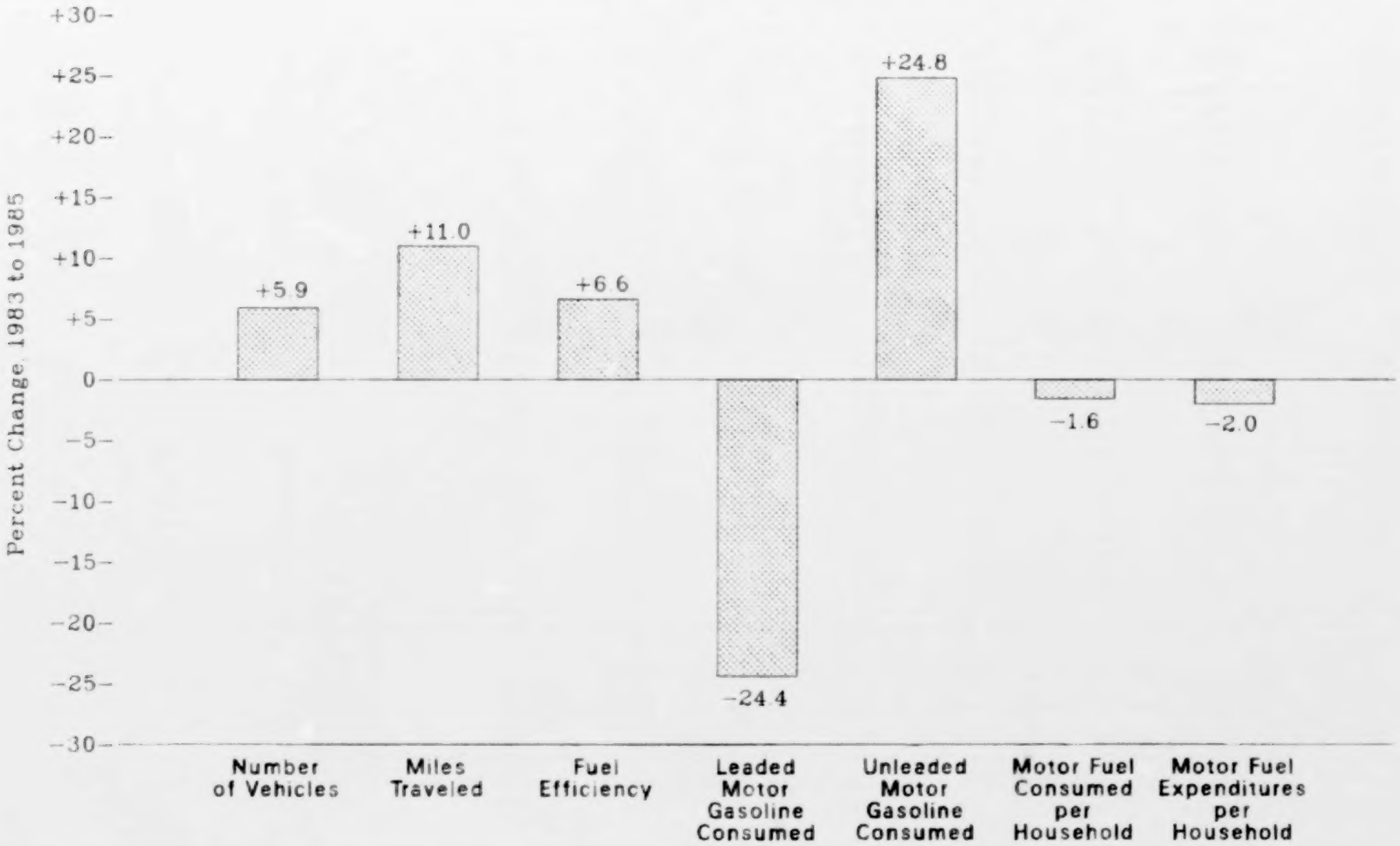
[5] Data for 1982 and 1984 are not available. Since 1981, the *Annual Housing Survey* has been a biennial survey.

NA = Not available.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1950, 1960, and 1970—Bureau of the Census, *Census of Population and Housing*. •1973 and forward—Bureau of the Census, *Annual Housing Survey*.

Figure 21. Household Motor Vehicle Data, Percent Change, 1983 to 1985



Source: See Table 21.

Table 21. Household Motor Vehicle Data, 1983 and 1985

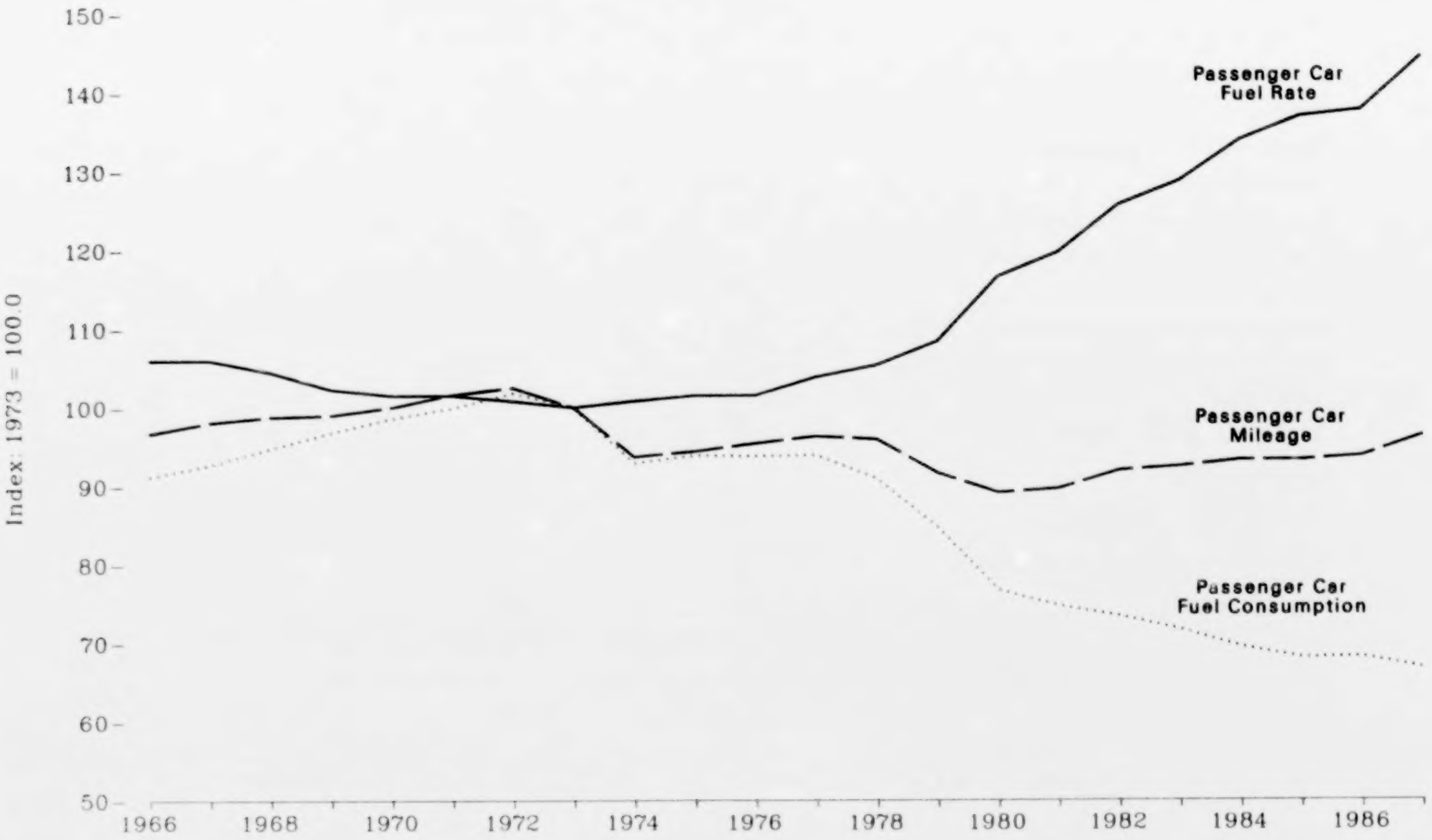
	Family Income					
	Less than $25,000		$25,000 or More		All Income Categories	
	1983	1985	1983	1985	1983	1985
Fuel Efficiency (miles per gallon)	14.4	15.3	15.8	16.8	15.1	16.1
Miles Traveled (billions)	589	587	630	766	1,219	1,353
Households with Vehicles (millions)	42.9	43.3	30.5	34.5	73.4	77.7
Vehicles (millions)	66.7	65.4	63.0	71.9	129.7	137.3
Motor Fuel Consumed (billion gallons)	40.8	38.2	39.8	45.7	80.5	83.9
Motor Gasoline Consumed (billion gallons)						
Leaded	19.2	13.5	13.2	11.0	32.4	24.5
Unleaded	20.9	24.2	25.3	33.7	46.3	57.8
Motor Fuel Expenditures (billion dollars)	48.1	44.8	47.3	54.3	95.4	99.1
Averages per Household with Vehicles						
Vehicles	1.6	1.5	2.1	2.1	1.8	1.8
Miles Traveled	13,721	13,558	20,668	22.228	16,605	17,402
Motor Fuel Consumed (gallons)	950	883	1,305	1,326	1,097	1,079
Motor Fuel Expenditures (dollars)	1,121	1,035	1,552	1,575	1,300	1,274
Averages per Vehicle						
Miles Traveled	8,837	8,972	9,996	10,658	9,400	9,855
Motor Fuel Consumed (gallons)	612	585	631	636	621	611
Motor Fuel Expenditures (dollars)	722	685	751	755	736	722
Price of Motor Gasoline (dollars per gallon)						
Leaded	1.14	1.11	1.14	1.11	1.14	1.11
Unleaded	1.22	1.20	1.22	1.21	1.22	1.21

Note: Motor fuel includes motor gasoline and a small amount of other fuels such as diesel, gasohol, and propane. These data for 1983 differ from previously published 1983 data, in that the basis for estimating the number of vehicle-owning households was changed to conform with that being used for 1985.

Note: Sum of components may not equal total due to independent rounding.

Source: Energy Information Administration, Form EIA-141 and Form EIA-429, "Residential Transportation Energy Consumption Survey."

Figure 22. Passenger Car Efficiency, 1966-1987



Source: See Table 22.

Table 22. Motor Vehicle Efficiency, 1966-1987

	Passenger Cars						All Motor Vehicles [1]					
	Mileage		Fuel Consumption		Fuel Rate		Mileage		Fuel Consumption		Fuel Rate	
Year	Thousand Miles per Car	Index 1973 = 100.0	Gallons per Car	Index 1973 = 100.0	Miles per Gallon	Index 1973 = 100.0	Thousand Miles per Vehicle	Index 1973 = 100.0	Gallons per Vehicle	Index 1973 = 100.0	Miles per Gallon	Index 1973 = 100.0
1966	9.92	96.7	703	91.2	14.1	106.0	9.68	95.8	780	91.8	12.4	96.1
1967	10.06	98.1	715	92.7	14.1	106.0	9.75	96.5	786	92.5	12.4	96.1
1968	10.14	98.8	731	94.8	13.9	104.5	9.86	97.6	805	94.7	12.3	95.4
1969	10.16	99.0	746	96.8	13.6	102.3	9.89	97.9	821	96.6	12.1	93.8
1970	10.27	100.0	760	98.6	13.5	101.5	10.00	99.0	830	97.7	12.0	93.0
1971	10.42	101.6	770	99.9	13.5	101.5	10.13	100.3	839	98.7	12.1	93.8
1972	10.52	102.5	785	101.8	13.4	100.8	10.28	101.8	857	100.1	12.0	93.0
1973	10.26	100.0	771	100.0	13.3	100.0	10.10	100.0	850	100.0	12.9	100.0
1974	9.61	93.7	716	92.9	13.4	100.8	9.49	94.0	788	92.7	12.1	93.8
1975	9.69	94.4	716	93.9	13.5	101.5	9.63	95.4	790	92.9	12.2	94.6
1976	9.79	95.4	723	93.8	13.5	101.5	9.74	96.4	806	94.8	12.1	93.8
1977	9.88	96.3	716	93.9	13.8	103.8	9.98	98.8	814	95.8	12.3	95.4
1978	9.84	95.9	701	90.9	14.0	105.3	10.08	99.8	816	96.0	12.4	96.1
1979	9.40	91.6	653	84.7	14.4	108.3	9.72	96.2	776	91.3	12.5	96.9
1980	9.14	89.1	591	76.7	15.5	116.5	9.46	93.2	712	83.8	13.3	103.1
1981	9.19	89.6	576	74.7	15.9	119.6	9.46	93.7	697	82.0	13.6	105.4
1982	9.43	91.9	566	73.4	16.7	125.6	9.64	95.5	686	80.7	14.1	109.3
1983	9.48	92.4	553	71.7	17.1	128.6	9.76	96.6	686	80.7	14.2	110.1
1984	9.56	93.2	536	69.5	17.8	133.8	10.02	99.2	691	81.3	14.5	112.4
1985	9.56	93.2	525	68.1	18.2	136.8	10.02	99.2	685	80.6	14.6	113.2
1986	9.61	93.7	526	68.2	18.3	137.6	10.12	100.2	690	81.2	14.7	114.0
1987[2]	9.88	96.3	515	66.8	19.2	144.4	10.46	103.6	695	81.8	15.1	117.1

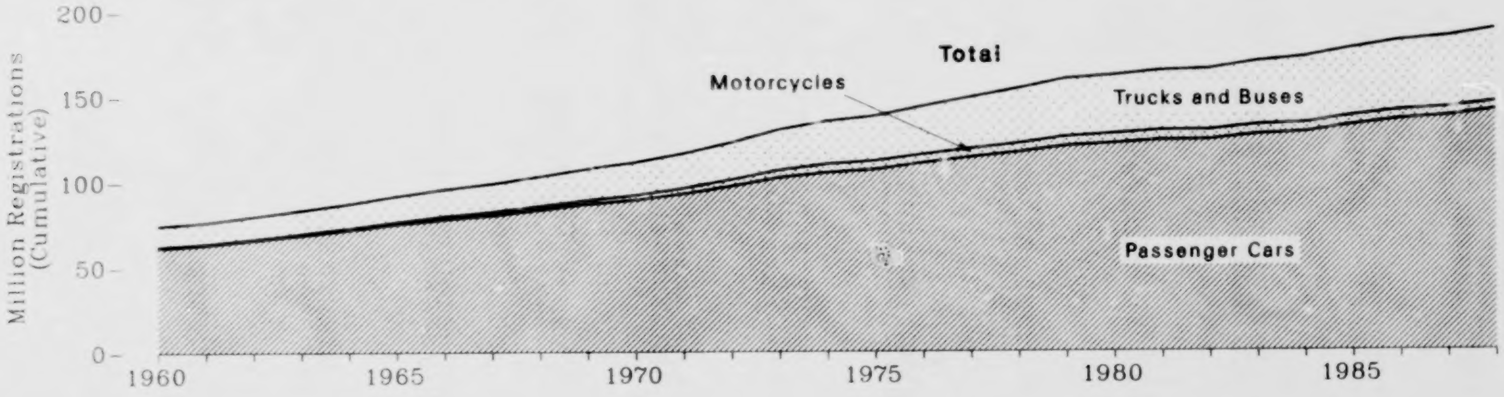
[1] Includes passenger cars, motorcycles, buses, and trucks.

[2] Preliminary.

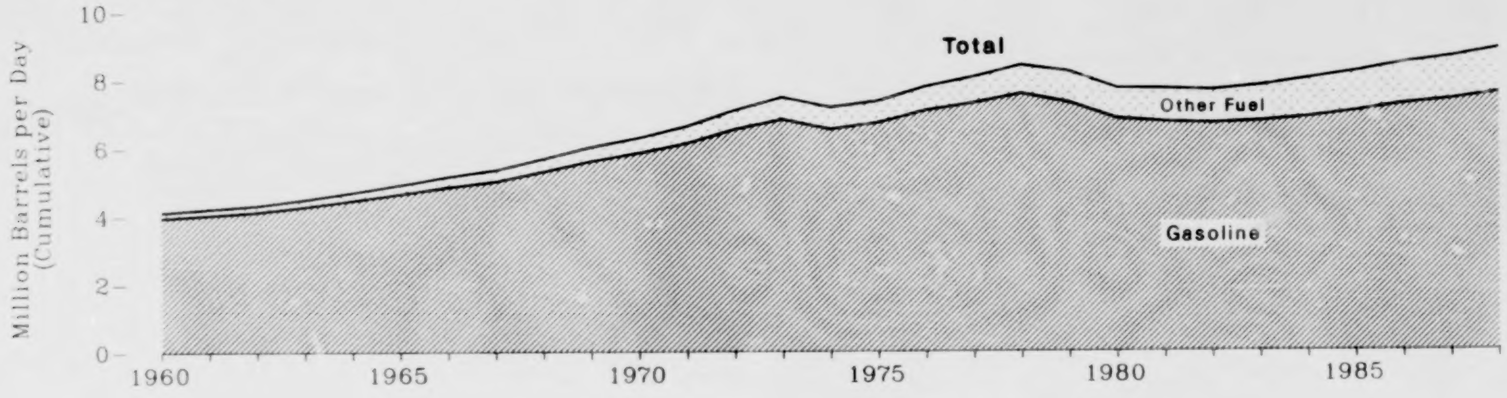
Source: •1966 through 1985—Federal Highway Administration, *Highway Statistics Summary to 1985*, Table VM-201A. •1986 and forward—Federal Highway Administration, *Highway Statistics Annual*, Table VM-1.

Figure 23. Motor Vehicle Registration and Motor Fuel Consumption, 1960–1988

Motor Vehicle Registration



Motor Fuel Consumption



Source: See Table 23.

Table 23. Motor Vehicle Registration and Motor Fuel Consumption, 1960-1988

Year	Motor Vehicle Registration (millions)					Motor Fuel Consumption[1] (thousand barrels per day)		
	Passenger Cars	Motorcycles	Buses	Trucks	Total	Gasoline[2]	Other Fuels[3]	Total[4]
1960	61.7	0.6	0.3	11.9	74.4	3,953	159	4,112
1961	63.4	0.6	0.3	12.3	76.6	4,034	176	4,210
1962	66.1	0.7	0.3	12.8	79.8	4,120	192	4,312
1963	69.0	0.8	0.3	13.4	83.5	4,274	211	4,485
1964	72.0	1.0	0.3	14.0	87.3	4,454	236	4,690
1965	75.3	1.4	0.3	14.8	91.7	4,644	269	4,913
1966	78.1	1.8	0.3	15.5	95.7	4,846	306	5,152
1967	80.4	2.0	0.3	16.2	98.9	5,014	329	5,343
1968	83.6	2.1	0.4	16.9	103.0	5,300	370	5,670
1969	86.9	2.3	0.4	17.9	107.4	5,604	413	6,017
1970	89.2	2.8	0.4	18.8	111.2	5,845	439	6,284
1971	92.7	3.3	0.4	19.9	116.3	6,125	494	6,619
1972	97.1	3.8	0.4	21.3	122.6	6,529	554	7,083
1973	102.0	4.4	0.4	23.2	130.0	6,819	642	7,460
1974	104.9	5.0	0.4	24.6	134.9	6,531	639	7,170
1975	106.7	5.0	0.5	25.8	137.9	6,719	628	7,347
1976	110.4	5.0	0.5	27.7	143.5	7,075	697	7,772
1977	113.7	5.0	0.5	29.6	148.8	7,287	760	8,046
1978	116.6	5.1	0.5	31.7	153.9	7,555	837	8,392
1979	120.2	5.5	0.5	33.3	159.6	7,291	913	8,204
1980	121.7	5.7	0.5	33.6	161.6	6,820	896	7,716
1981	123.5	5.8	0.5	34.5	164.3	6,726	969	7,695
1982	123.7	5.7	0.6	35.3	165.3	6,679	972	7,651
1983	126.7	5.6	0.6	36.5	169.4	6,731	1,043	7,774
1984	127.9	5.5	0.6	38.0	172.0	6,850	1,127	7,977
1985	132.1	5.4	(5)	39.6	177.1	7,020	1,158	8,178
1986	135.4	5.3	(5)	40.8	181.5	7,229	1,202	8,431
1987	137.3	4.9	(5)	41.7	183.9	7,359	1,242	8,601
1988[6]	140.7	4.7	(5)	42.8	188.2	7,552	1,290	8,842

[1] Includes only motor fuel taxed at the prevailing tax rates in each State. Excludes motor fuel exempt from tax payment, subject to tax refund, or taxed at rates other than the prevailing tax rate. Experience has shown that the total motor fuel consumption quantity cited here equals more than 99.0 percent of gross reported motor fuel consumption.

[2] Includes motor gasoline, aviation gasoline, and gasohol.

[3] Includes distillate fuel oil (diesel oil), liquefied gases, and kerosene when they are used to operate vehicles on highways. Excludes jet fuel beginning in 1962.

[4] Excludes losses allowed for evaporation, handling, etc.

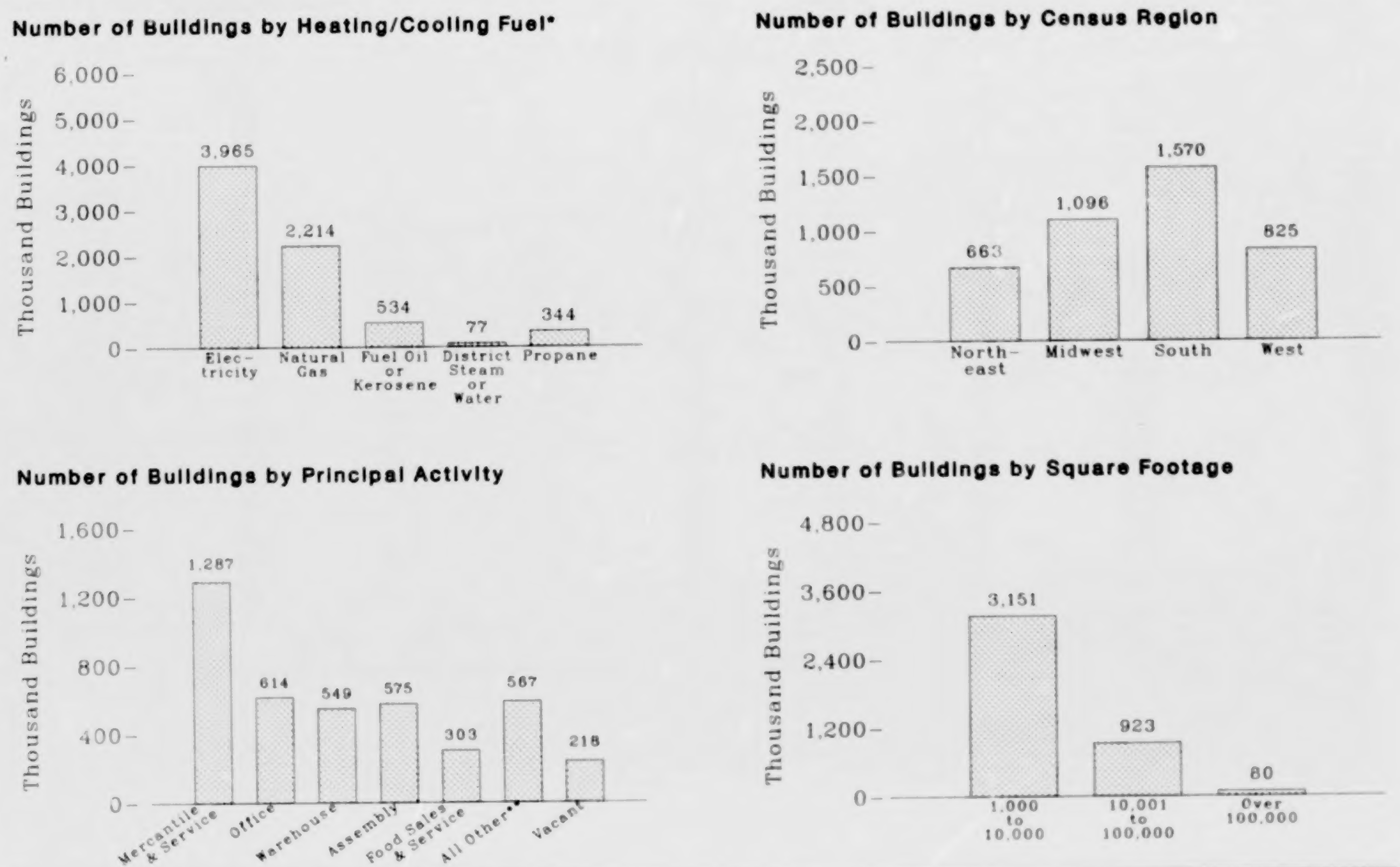
[5] Included in trucks.

[6] Estimated.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1960 through 1975—Federal Highway Administration, *Highway Statistics Summary to 1975*, Tables MV-201 and MF-221. •1976 through 1986—Federal Highway Administration, *Highway Statistics Annual*, Tables MV-1, MF-21, and MF-25. •1987 and forward—Federal Highway Administration, *Selected Highway Statistics and Charts 1987*.

Figure 24. Characteristics of Commercial Buildings, 1986



*Fuels used for all end uses, alone or in combination.

**"All Other" includes Education, Health Care, Lodging, and Other.

Source: See Table 24.

Table 24. Characteristics of Commercial Buildings by Heating and Cooling End Uses, 1979, 1983, and 1986

(Thousand Buildings)

	All Buildings			All Buildings with Space Heating			All Buildings with Space Cooling		
	1979	1983	*1986*[1]	1979	1983	*1986*[1]	1979	1983	*1986*[1]
All Buildings	3,969	3,947	*4,154*	3,543	3,400	*3,657*	2,526	2,620	*2,862*
Fuels Used in the Building for All End Uses (Alone or in Combination)									
Electricity	3,840	3,764	*3,965*	3,532	3,391	*3,627*	2,524	2,620	*2,856*
Natural Gas	2,237	2,239	*2,214*	2,180	2,176	*2,185*	1,583	1,647	*1,793*
Fuel Oil[2]	810	538	*534*	803	532	*528*	456	332	*316*
District Heat[3]	48	58	*77*	48	58	*77*	36	41	*61*
Propane	308	250	*344*	304	242	*330*	187	161	*210*
Census Region[4]									
Northeast	697	670	*663*	654	606	*604*	433	442	*390*
Midwest	1,236	1,211	*1,096*	1,146	1,090	*967*	793	796	*669*
South	1,471	1,493	*1,570*	1,259	1,230	*1,402*	1,055	1,100	*1,256*
West	565	574	*825*	484	474	*684*	246	282	*548*
Principal Activity Within the Building									
Assembly	475	457	*575*	459	433	*541*	292	291	*406*
Education	168	177	*241*	166	173	*237*	114	130	*172*
Food Sales/Service	384	380	*303*	364	349	*288*	313	313	*276*
Health Care	55	61	*52*	55	60	*52*	47	55	*49*
Lodging	107	106	*137*	105	101	*131*	72	79	*101*
Mercantile/Service	1,181	1,071	*1,287*	1,101	943	*1,205*	686	652	*886*
Office	545	575	*614*	533	559	*605*	495	522	*574*
Residential	272	236	*NA*	272	223	*NA*	183	164	*NA*
Warehouse	451	425	*549*	271	294	*341*	175	226	*213*
Other	173	179	*157*	144	134	*129*	96	98	*86*
Vacant	159	281	*238*	75	130	*128*	54	92	*99*
Building Square Footage									
1,000 or Less	655	546	*NA*	488	388	*NA*	314	274	*NA*
1,001 to 10,000	2,402	2,428	*3,151*	2,185	2,108	*2,723*	1,503	1,573	*2,074*
10,001 to 100,000	849	896	*923*	808	829	*857*	655	706	*719*
Over 100,000	64	78	*80*	62	74	*77*	54	68	*70*

[1] Estimates for 1986 are not directly comparable to those for 1979 and 1983 because of changes in survey coverage.

[2] Includes kerosene, distillate fuel oil, and residual fuel oil.

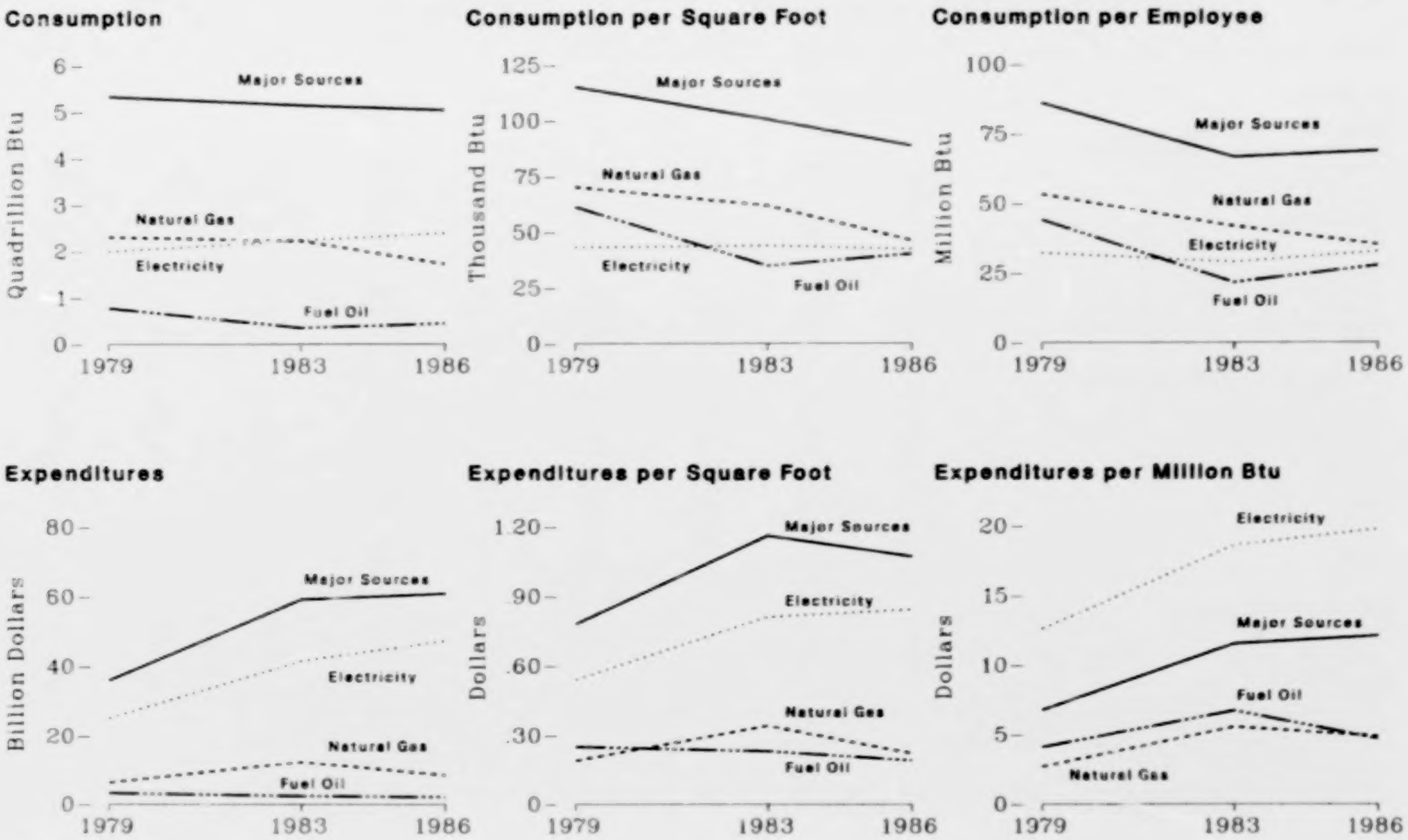
[3] For 1979 and 1983, includes purchased steam. For 1986, includes purchased and nonpurchased steam and hot water.

[4] See Appendix D for Census Regions.

NA = Not available.

Source: •1979—Energy Information Administration, Form EIA-143, "Nonresidential Buildings Energy Consumption Survey." •1983—Energy Information Administration, Form EIA-788, "Nonresidential Buildings Energy Consumption Survey." •1986—Energy Information Administration, Forms EIA-871A through F, "Nonresidential Buildings Energy Consumption Survey."

Figure 25. Commercial Buildings Energy Consumption and Expenditure Indicators, 1979, 1983, and 1986



Source: See Table 25.

Table 25. Commercial Buildings Energy Consumption and Expenditure Indicators, 1979, 1983, and 1986

	Building Data			Energy Consumption				Energy Expenditures			
Energy Source and Year	Number of Buildings (thousand)	Total Square Feet (million)	Square Feet per Building (thousand)	Total (trillion Btu)	Per Building (million Btu)	Per Square Foot (thousand Btu)	Per Employee (million Btu)	Total (million dollars)	Per Building (thousand dollars)	Per Square Foot (dollars)	Per Million Btu (dollars)
Electricity											
1979	3,840	46,236	12.0	1,994	519	43.1	32.2	25,082	6.5	0.54	12.58
1983	3,764	51,047	13.6	2,234	593	43.8	28.9	41,473	11.0	0.81	18.56
1986 [1]	*3,965*	*56,508*	*14.3*	*2,390*	*603*	*42.3*	*32.7*	*47,186*	*11.9*	*0.84*	*19.74*
Natural Gas											
1979	2,237	32,810	14.7	2,304	1,030	70.2	53.2	6,199	2.8	0.19	2.69
1983	2,239	36,024	16.1	2,226	994	61.8	41.8	12,278	5.5	0.34	5.52
1986 [1]	*2,214*	*37,263*	*16.8*	*1,723*	*778*	*46.2*	*35.2*	*8,355*	*3.8*	*0.22*	*4.85*
Fuel Oil [2]											
1979	810	12,622	15.6	774	955	61.3	44.1	3,171	3.9	0.25	4.10
1983	538	10,188	19.0	354	659	34.8	21.6	2,369	4.4	0.23	6.69
1986 [1]	*534*	*11,005*	*20.6*	*442*	*827*	*40.1*	*27.7*	*2,059*	*3.9*	*0.19*	*4.66*
District Heat [3]											
1979	48	3,814	78.8	204	4,216	53.5	26.7	1,287	26.6	0.34	6.30
1983	58	4,508	77.1	294	5,024	65.2	36.1	2,678	45.8	0.59	9.11
1986 [1]	*77*	*4,625*	*59.7*	*422*	*5,446*	*91.2*	*52.4*	*2,620*	*33.8*	*0.57*	*6.21*
Major Sources [4]											
1979	3,852	46,299	12.0	5,328	1,383	115.1	86.0	36,007	9.3	0.78	6.76
1983	3,774	51,180	13.6	5,145	1,363	100.5	66.6	59,150	15.7	1.16	11.50
1986 [1]	*3,992*	*56,825*	*14.2*	*5,040*	*1,262*	*88.7*	*68.8*	*60,762*	*15.2*	*1.07*	*12.06*

[1] Estimates for 1986 are not directly comparable to those for 1979 and 1983 because of changes in survey coverage.

[2] Includes kerosene, distillate fuel oil, and residual fuel oil.

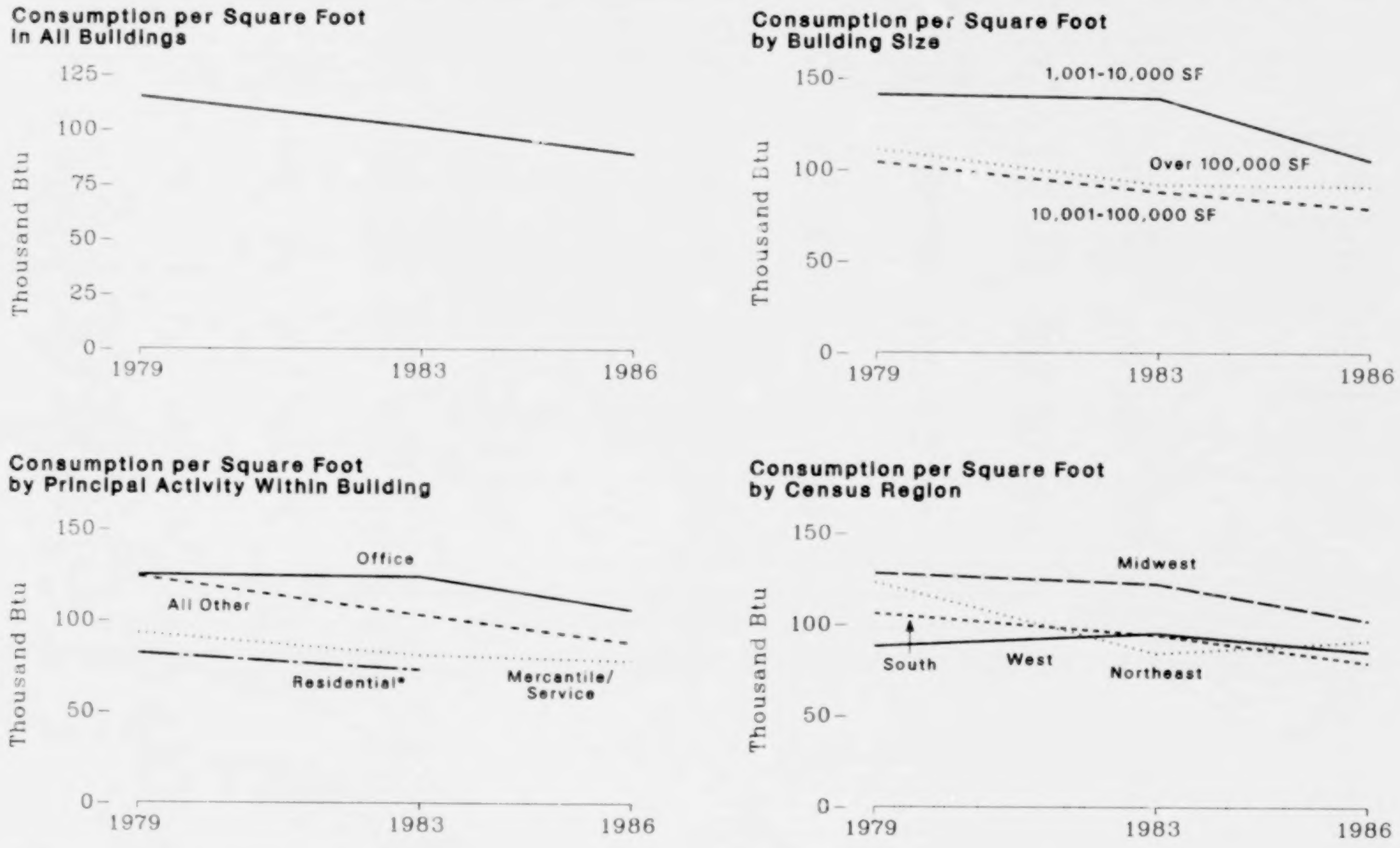
[3] For 1979 and 1983, includes only purchased steam. For 1986, includes purchased and nonpurchased steam and purchased and nonpurchased hot water.

[4] Includes propane not shown separately.

Note: Statistics for individual fuels are for all buildings using each fuel. Statistics for Major Sources are for the sum of electricity, natural gas, fuel oil, district heat, and propane, across all buildings using any of those fuels.

Sources: •1979—Energy Information Administration, Form EIA-143, "Nonresidential Buildings Energy Consumption Survey." •1983—Energy Information Administration, Form EIA-788, "Nonresidential Buildings Energy Consumption Survey." •1986—Energy Information Administration, Form EIA-871, "Nonresidential Buildings Energy Consumption Survey."

Figure 26. Commercial Buildings Energy Consumption Characteristics by Fuel Source, 1979, 1983, and 1986



Consumption per Square Foot in All Buildings

Consumption per Square Foot by Building Size

Consumption per Square Foot by Principal Activity Within Building

Consumption per Square Foot by Census Region

*No data for 1986.
Source: See Table 26.

Table 26. Commercial Buildings Energy Consumption Characteristics by Fuel Source, 1979, 1983, and 1986

		Square Footage Category				Principal Activity Within Building				Census Region [1]			
	All Buildings	1,000 or Less	1,001 to 10,000	10,001 to 100,000	Over 100,000	Mercantile and Service	Office	Residential	All Other	North-east	Mid-west	South	West
Buildings Using Any Major Fuel													
Square Feet (billion)													
1979	46.30	0.34	9.64	22.41	13.91	10.08	7.04	2.76	26.42	11.04	15.10	13.88	6.28
1983	51.18	0.29	9.47	23.23	18.19	10.35	8.34	2.44	30.05	11.41	15.72	16.68	7.37
1986 [2]	*56.82*	*NA*	*12.58*	*25.64*	*18.60*	*12.78*	*9.53*	*NA*	*34.51*	*11.51*	*15.73*	*18.88*	*10.71*
Consumption per Square Foot (thousand Btu)													
1979	115	303	141	104	111	93	125	82	124	123	128	106	88
1983	101	397	139	88	92	81	124	73	103	84	122	94	95
1986 [2]	*89*	*NA*	*105*	*79*	*91*	*78*	*106*	*NA*	*88*	*91*	*102*	*79*	*85*
Consumption of Major Fuels (trillion Btu)													
Electricity													
1979	1,994	47	443	890	615	372	430	41	1,151	450	617	694	233
1983	2,234	65	484	920	765	435	515	42	1,242	345	697	853	338
1986 [2]	*2,390*	*NA*	*654*	*927*	*809*	*536*	*641*	*NA*	*1,214*	*430*	*584*	*867*	*510*
Natural Gas													
1979	2,304	36	682	1,041	545	434	279	99	1,492	483	1,070	487	263
1983	2,226	43	717	858	608	337	370	95	1,423	314	1,044	550	318
1986 [2]	*1,723*	*NA*	*485*	*715*	*523*	*332*	*258*	*NA*	*1,133*	*244*	*742*	*426*	*311*
Fuel Oil [3]													
1979	774	16	203	317	238	108	111	79	476	356	139	251	28
1983	354	W	91	166	93	45	W	35	198	206	30	107	W
1986 [2]	*442*	*NA*	*114*	*206*	*121*	*105*	*39*	*NA*	*298*	*270*	*63*	*86*	*23*
District Heat [4]													
1979	204	W	W	62	138	W	58	W	135	65	95	W	W
1983	294	W	W	85	203	W	68	W	205	86	144	34	30
1986 [2]	*422*	*NA*	*20*	*159*	*243*	*12*	*71*	*NA*	*339*	*94*	*196*	*81*	*51*
Major Sources [5]													
1979	5,328	104	1,360	2,325	1,540	935	880	226	3,288	1,358	1,940	1,477	553
1983	5,145	115	1,317	2,041	1,671	840	1,031	179	3,095	954	1,922	1,568	701
1986 [2]	*5,040*	*NA*	*1,317*	*2,026*	*1,697*	*1,002*	*1,010*	*NA*	*3,028*	*1,046*	*1,603*	*1,485*	*906*

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[1] See Appendix D for Census regions.

[2] Estimates for 1986 are not directly comparable to those from 1979 and 1983 because of changes in survey coverage.

[3] Includes kerosene, distillate fuel oil, and residual fuel oil.

[4] For 1979 and 1983, includes only purchased steam. For 1986, includes purchased and nonpurchased steam and purchased and nonpurchased hot water.

[5] Includes propane not shown separately.

NA = Not available.

W = Data withheld either because the Relative Standard Error was more than 50 percent or because fewer than 20 buildings were sampled.

Source: •1979—Energy Information Administration, Form EIA-143, "Nonresidential Buildings Energy Consumption Survey." •1983—Energy Information Administration, Form EIA-788, "Nonresidential Buildings Energy Consumption Survey." •1986—Energy Information Administration, Form EIA-871, "Nonresidential Buildings Energy Consumption Survey."

3. Selected Financial Indicators

Fossil Fuel Real Prices Down from Record Levels

From the 1949 level of $1.12 per million Btu, real prices[1] of fossil fuels[2] trended downward to a low of $0.75 in 1969 (27).[3] Thereafter, prices began to escalate, sometimes abruptly. In 1974, the composite price of fossil fuels jumped from the 1973 level of $0.80 to $1.25, surpassing the 1949 level for the first time and registering the largest year-to-year increase (56 percent) of the 40-year period. The peak of $2.92 was reached in 1981. However, the price then declined, plunging 36 percent in 1986 alone. By 1988, the composite price of fossil fuels was $1.26.

Crude oil was the most expensive of the fossil fuels throughout most of the period. Only anthracite was more expensive, and in only 3 years (1975 through 1977). At its peak in 1981, the real price of crude oil reached $5.83, more than triple the price of natural gas and more than quadruple the price of nonanthracitic coal.

Energy Expenditures Declined in 1986

The energy expenditure measure is the product of energy consumption and energy prices. In 1986 (the most recent year for which data are available), a slight rise in energy consumption was overwhelmed by a sizable decline in energy prices. Energy expenditures fell dramatically, from $445 billion in 1985 to $381 billion in 1986 (29).

End-use expenditures of $173 billion for petroleum products accounted for the largest share (46 percent) of total energy expenditures. The year-to-year decline in petroleum expenditures was $51 billion and represented most of the $64-billion decline in total energy expenditures. Sales of electricity (net of expenditures by electric utilities for most fuels used to generate electricity) totaled $114 billion; nuclear fuel, wood, and waste used at electric utilities accounted for $3 billion. Expenditures for natural gas and coal were $62 billion and $28 billion, respectively.

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[1] Real prices are expressed in constant 1982 dollars.

[2] Crude oil, natural gas, and coal.

[3] Numbers in parentheses indicate related tables. Annual data are the most recent available and frequently are preliminary.

Energy Industry Income and Investment

In 1987 (the most recent year for which data are available), the 22 major energy companies included in the Financial Reporting System (FRS)[4] accounted for 57 percent of U.S. crude oil and natural gas liquids production, 44 percent of dry natural gas production, and smaller shares of coal and uranium production (34). They also accounted for over three-fourths of refinery capacity and output in 1987. In 1987, the FRS companies continued to play a significant role in the U.S. economy, accounting for 34 percent of the profits and 26 percent of the assets of *Fortune's* 500 largest U.S. industrial firms.[5]

The FRS companies were involved in a wide range of business activities, but, from 1977 through 1987, petroleum and natural gas production was their primary source of net income (35). However, during 1985 through 1987, sharp swings in oil prices led to fluctuations in the FRS companies' net income and in the share of net income attributable to oil and gas production. When oil prices collapsed in 1986, net income from domestic production fell from $12 billion in 1985 to $1 billion in 1986 and net income from foreign production fell from $8 billion to under $5 billion (35). In 1987, oil prices partially recovered, and net income from domestic oil and gas production rose to nearly $5 billion, while net income from foreign production rose to slightly over that amount.

Nevertheless, the FRS companies continued to scale back additions to investment in domestic oil and gas production. In 1987, additions totaled $11 billion, the lowest level since 1978 (37), and the domestic oil and gas production share of net investment in place fell to 36 percent (36). Additions to investment in foreign production totaled $7 billion in 1987. The retrenchment in exploration and development is likely to lead to deterioration of the FRS companies' oil and gas reserves in the long term.

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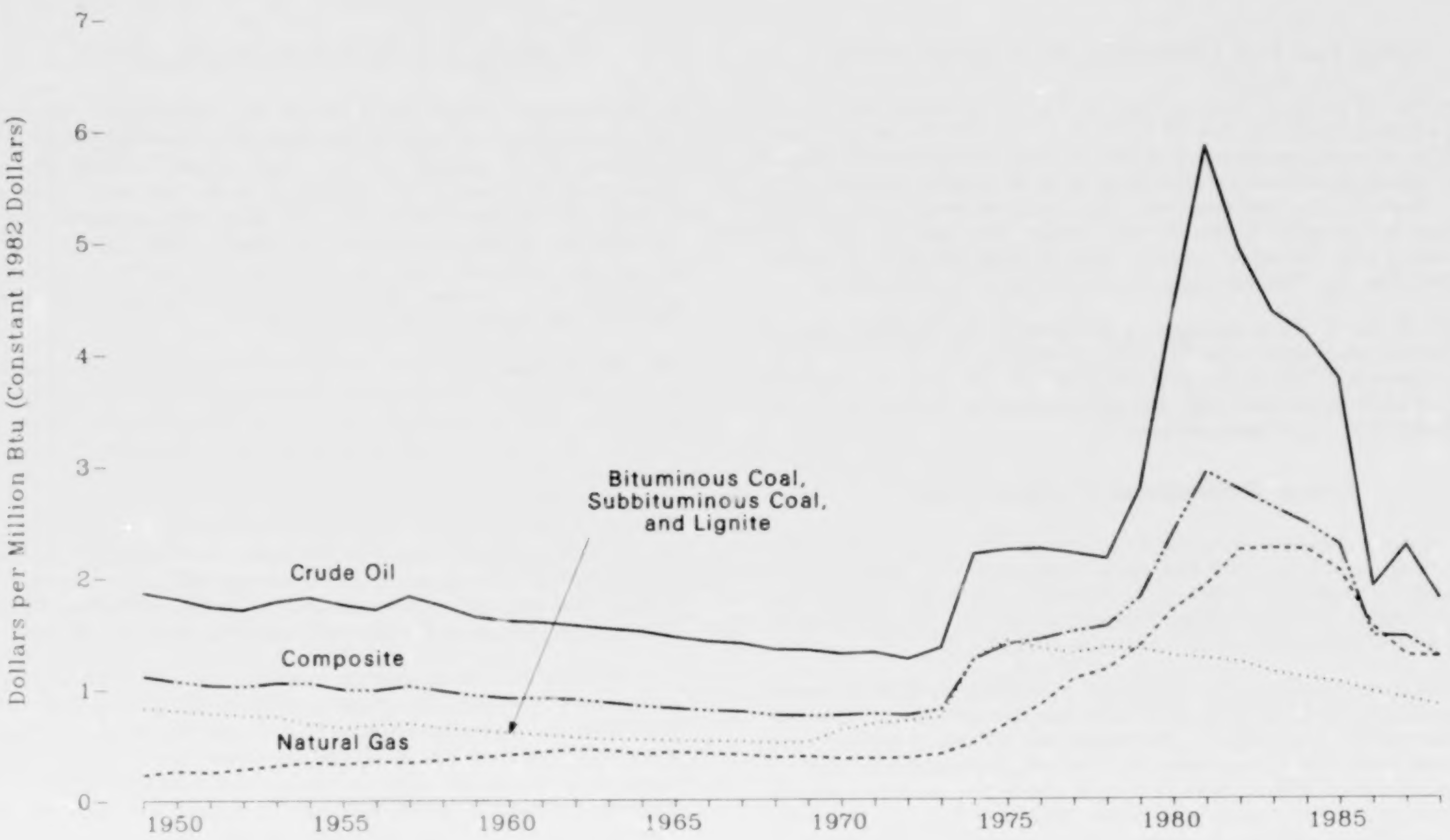
[4] The FRS collects financial data from the major energy-producing companies. See Appendix E, note 3.

[5] Energy Information Administration, *Performance Profiles of Major Energy Producers 1987*, DOE/EIA-0206(87) (Washington, DC, January 1989), p. 1.

Figure 27. Fossil Fuel Prices, 1949–1988



Source: See Table 27.

Table 27. Fossil Fuel Prices, 1949-1988

(Cents per Million Btu)

Year	Crude Oil [1]		Natural Gas [2]		Bituminous Coal, Subbituminous Coal, and Lignite		Anthracite		Composite [3]		
	Current	Constant [4]	Current	Constant [4]	Current	Constant [4]	Current	Constant [4]	Current	Constant [4]	Percent Change
1949	43.8	186.4	5.4	23.0	19.5	83.0	26.4	154.9	26.2	111.5	—
1950	43.3	181.2	6.3	26.4	19.3	80.8	37.9	158.6	25.6	107.1	-3.9
1951	43.6	173.7	6.3	25.1	19.6	78.1	40.7	162.2	25.9	103.2	-3.6
1952	43.6	171.0	7.2	28.2	19.5	76.5	39.3	154.1	26.1	102.4	-0.8
1953	46.2	178.4	8.1	31.3	19.5	75.3	40.7	157.1	27.3	105.4	2.9
1954	47.9	182.1	9.0	34.2	18.0	68.4	36.1	137.3	27.7	105.3	-0.1
1955	47.8	175.7	8.9	32.7	17.8	65.4	33.1	121.7	27.1	99.6	-5.4
1956	48.1	171.2	9.9	35.2	19.1	68.0	34.9	124.2	27.8	98.9	-0.7
1957	53.3	183.2	9.9	34.0	20.1	69.1	38.3	131.6	29.9	102.7	3.8
1958	51.9	174.7	10.8	36.4	19.4	65.3	38.0	127.9	29.2	98.3	-4.3
1959	50.0	164.5	11.7	38.5	19.1	62.8	35.9	118.1	28.6	94.1	-4.3
1960	49.7	160.8	12.6	40.8	18.8	60.8	33.8	109.4	28.3	91.6	-2.7
1961	49.8	159.6	13.5	43.3	18.4	59.0	34.6	110.9	28.6	91.7	0.1
1962	50.0	156.7	14.5	45.5	18.0	56.4	33.6	105.3	28.8	90.3	-1.5
1963	49.8	153.7	14.5	44.8	17.6	54.3	36.6	113.0	28.3	87.3	-3.3
1964	49.7	151.1	13.6	41.3	17.9	54.4	38.0	115.5	27.7	84.2	-3.6
1965	49.3	145.9	14.5	42.9	17.9	53.0	36.3	107.4	27.7	82.0	-2.6
1966	49.7	142.0	14.5	41.4	18.4	52.6	34.8	99.4	28.0	80.0	-2.4
1967	50.3	140.1	14.5	40.4	18.8	52.4	36.0	100.3	28.4	79.1	-1.1
1968	50.7	134.5	14.3	37.9	19.1	50.7	39.2	104.0	28.5	75.6	-4.4
1969	53.3	133.9	15.4	38.7	20.5	51.5	44.0	110.6	29.9	75.1	-0.7
1970	54.8	130.5	15.4	36.7	26.2	62.4	48.8	116.2	31.7	75.5	0.5
1971	58.4	131.5	16.3	36.7	30.1	67.8	53.2	119.8	34.0	76.6	1.5
1972	58.4	125.6	17.3	37.2	32.7	70.3	55.3	118.9	35.0	75.3	-1.7
1973	67.1	135.6	20.1	40.6	36.5	73.7	61.7	124.6	39.8	80.4	6.8
1974	118.4	219.3	27.3	50.6	68.2	126.3	102.2	189.3	67.6	125.2	55.7
1975	132.2	222.9	40.2	67.8	83.9	141.5	149.5	252.1	82.1	138.4	10.5
1976	141.2	223.8	53.1	84.2	85.0	134.7	153.9	243.9	90.2	142.9	3.3
1977	147.8	219.6	72.3	107.4	87.7	130.3	153.8	228.5	100.8	149.8	4.8
1978	155.2	215.0	83.6	115.8	97.9	135.6	152.7	211.5	111.6	154.6	3.2
1979	217.9	277.2	108.1	137.5	105.3	134.0	177.2	225.4	141.7	180.3	16.6
1980	372.2	434.3	144.8	169.0	109.4	127.7	185.9	216.9	204.2	238.3	32.2
1981	547.8	582.8	179.5	191.0	117.9	125.4	190.1	202.2	274.5	292.0	22.5
1982	491.7	491.7	222.2	222.2	122.1	122.1	214.0	214.0	275.8	275.8	-5.5
1983	451.6	434.6	232.3	223.6	117.2	112.8	230.0	221.4	270.1	260.0	-5.7
1984	446.2	414.3	239.9	222.7	115.9	107.6	208.7	193.8	264.6	245.7	-5.5
1985	415.3	374.5	225.7	203.5	114.8	103.5	204.2	184.1	251.2	226.5	-7.8
1986	215.7	189.4	174.8	153.5	108.2	95.0	191.1	167.8	165.3	145.1	-35.9
1987	265.5	225.6	150.2	127.6	104.9	89.1	188.9	160.5	170.0	144.4	-0.5
1988[5]	216.7	178.1	153.8	126.4	100.8	82.8	181.8	149.4	153.5	126.1	-12.7

[1] Includes lease condensate.

[2] Wet natural gas, prior to extraction of natural gas plant liquids.

[3] Derived by multiplying the price per Btu of each fossil fuel by the total Btu content of the production of each fossil fuel and dividing this accumulated value of total fossil fuel production by the accumulated Btu content of total fossil fuel production.

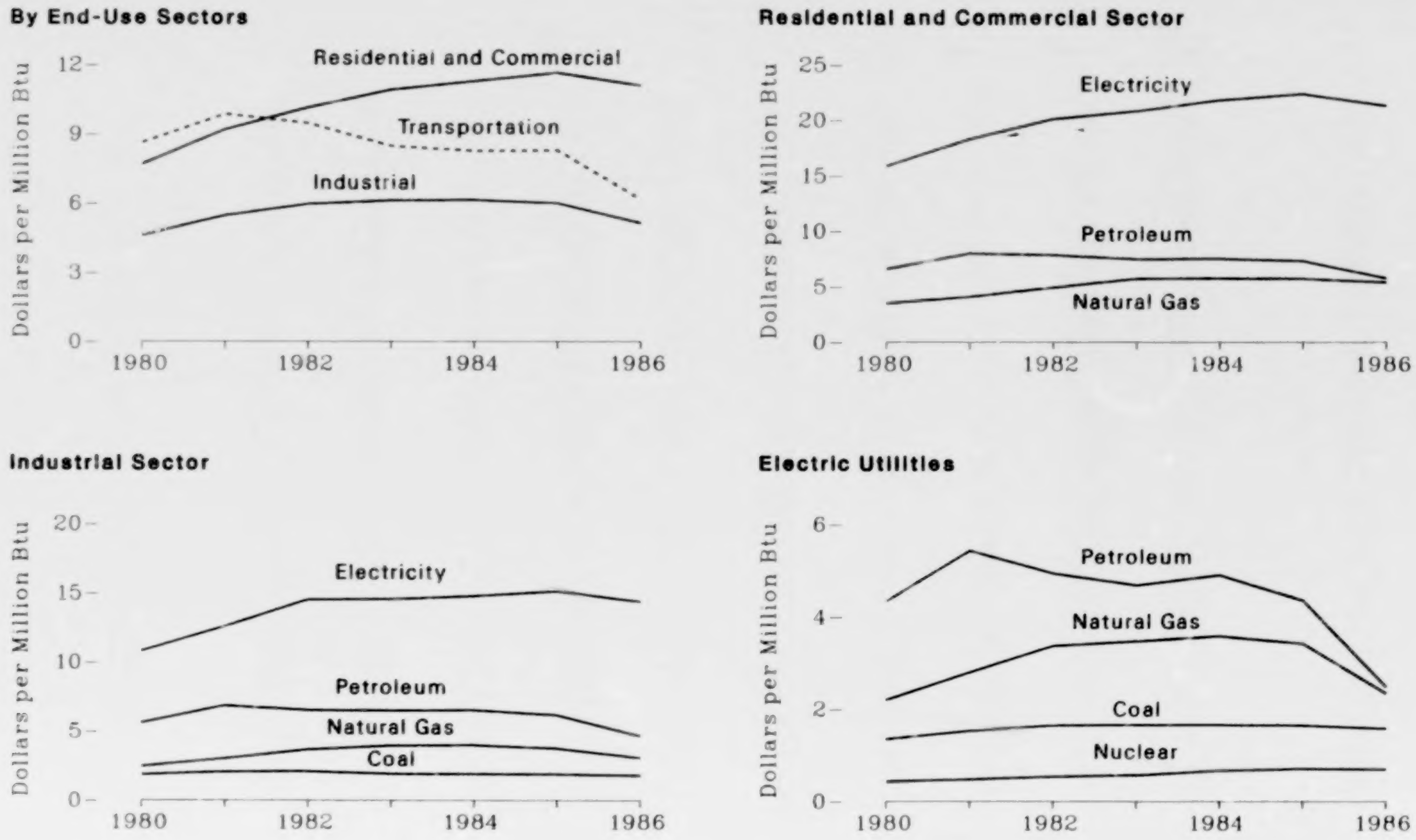
[4] In 1982 dollars, calculated using implicit GNP price deflators.

[5] Preliminary.

Note: All fuel prices taken as close as possible to the point of production.

Sources: Tables 63, 74, and 83 and Appendices A and C.

Figure 28. Energy Price Estimates by Sector, 1980–1986



Source: See Table 28.

Table 28. Energy Price Estimates by Sector, 1970, 1975, and 1980-1986

(Dollars per Million Btu)

End-Use Sector (Including Electric Utilities)	1970	1975	1980	1981	1982	1983	1984	1985	1986
Residential and Commercial Sector	2.07	3.93	7.68	9.18	10.13	10.90	11.27	11.[illegible]	11.06
Primary Energy	1.08	1.97	4.36	5.09	5.59	6.11	6.14	6.09	5.46
Coal	0.73	1.78	2.10	2.54	2.59	2.30	2.43	2.37	2.23
Natural Gas	0.96	1.56	3.50	4.09	4.93	5.72	5.75	5.73	5.42
Petroleum Products [1]	1.32	2.82	6.58	7.98	7.85	7.48	7.53	7.33	5.79
Distillate Fuel Oil	1.32	2.67	6.86	8.44	8.17	7.29	7.33	7.03	5.43
Liquefied Petroleum Gases	1.98	3.81	7.51	7.99	8.80	9.07	8.91	8.87	8.36
Motor Gasoline	2.86	4.67	9.77	10.96	10.45	9.13	8.94	9.01	6.76
Residual Fuel Oil	0.45	1.91	4.12	5.12	4.67	4.51	4.78	4.28	2.55
Electricity	6.33	10.21	15.86	18.29	20.11	20.83	21.82	22.39	21.33
Industrial Sector	0.79	2.10	4.60	5.46	5.95	6.10	6.12	5.98	5.13
Primary Energy	0.57	1.60	3.71	4.38	4.62	4.63	4.63	4.40	3.52
Coal	0.45	1.50	1.87	2.06	2.09	1.91	1.90	1.89	1.80
Coking Coal	0.45	1.65	2.10	2.34	2.43	2.14	2.09	2.08	1.90
Steam Coal	0.44	1.28	1.56	1.75	1.84	1.75	1.76	1.81	1.75
Natural Gas	0.35	0.93	2.46	3.02	3.67	3.95	3.99	3.75	3.07
Petroleum Products [2]	0.96	2.40	5.61	6.85	6.52	6.49	6.52	6.16	4.65
Asphalt and Road Oil	0.68	1.89	3.68	5.02	4.24	4.32	4.54	4.77	4.35
Distillate Fuel Oil	0.72	2.23	5.54	6.52	6.63	6.19	6.38	5.93	3.59
Liquefied Petroleum Gases	1.10	2.51	5.18	5.76	6.19	6.66	6.49	5.82	5.77
Lubricants	5.08	7.49	14.36	18.00	17.25	16.98	17.63	17.61	15.59
Residual Fuel Oil	0.46	1.91	3.69	4.48	4.45	4.38	4.69	4.22	2.34
Electricity	2.99	6.07	10.81	12.57	14.51	14.54	14.77	15.12	14.36
Transportation Sector	2.32	4.04	8.62	9.85	9.45	8.46	8.25	8.27	6.16
Primary Energy	2.32	4.03	8.62	9.85	9.45	8.45	8.25	8.26	6.16
Coal	0.41	1.26	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Petroleum Products [4]	2.32	4.03	8.62	9.85	9.45	8.45	8.25	8.26	6.16
Distillate Fuel Oil	1.31	2.80	7.19	8.55	8.14	7.56	7.61	7.50	5.80
Jet Fuel	0.73	2.04	6.36	7.57	7.23	6.51	6.24	5.91	3.92
Motor Gasoline	2.85	4.65	9.84	10.94	10.40	9.12	8.89	9.01	6.78
Residual Fuel Oil	0.38	1.73	3.31	4.44	4.54	4.42	4.67	4.41	2.28
Electricity	4.62	12.08	14.82	16.82	20.31	20.98	20.28	19.86	19.62
Electric Utilities	0.32	0.96	1.75	2.00	2.01	1.97	1.97	1.85	1.55
Coal	0.31	0.82	1.35	1.53	1.65	1.66	1.66	1.65	1.58
Natural Gas	0.28	0.75	2.20	2.80	3.37	3.47	3.58	3.42	2.34
Petroleum Products [5]	0.42	2.00	4.34	5.43	4.94	4.68	4.90	4.35	2.48
Heavy Oil [6]	0.41	1.99	4.25	5.32	4.8[illegible]	4.60	4.82	4.24	2.42
Nuclear Fuel	0.18	0.24	0.43	0.48	0.54	0.57	0.67	0.71	0.70
Wood and Waste	0.65	0.92	1.74	1.24	1.28	1.12	1.28	0.79	0.32

[1] In addition to listed products, includes kerosene.

[2] In addition to listed products, includes jet fuel, kerosene, motor gasoline, still gas, special naphthas, petrochemical feedstocks, petroleum coke, wax, pentanes plus, and miscellaneous products.

[3] Not applicable.

[4] In addition to listed products, includes aviation gasoline, liquefied petroleum gases, and lubricants.

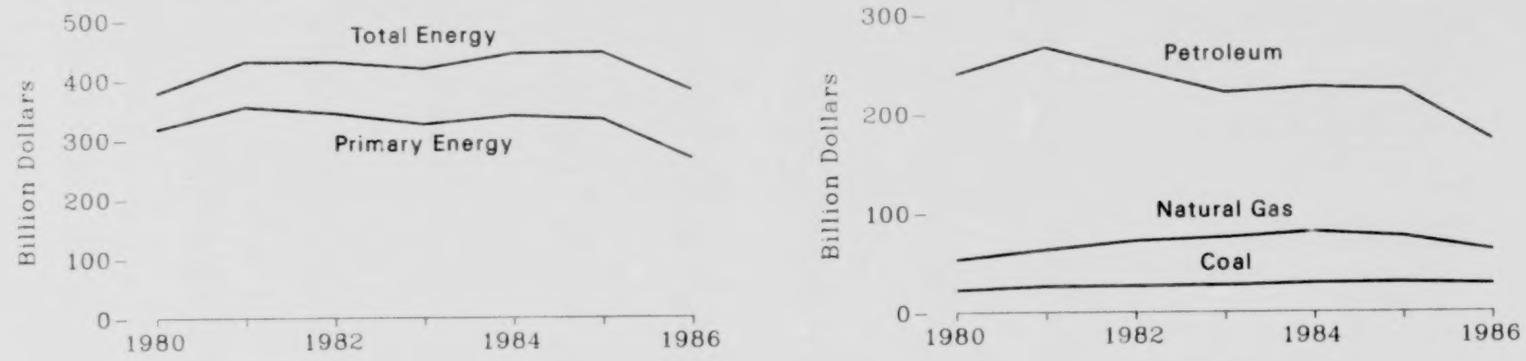
[5] In addition to listed products, includes distillate fuel oil, jet fuel, and petroleum coke.

[6] Heavy oil includes Grade Nos. 4, 5, and 6 fuel oils.

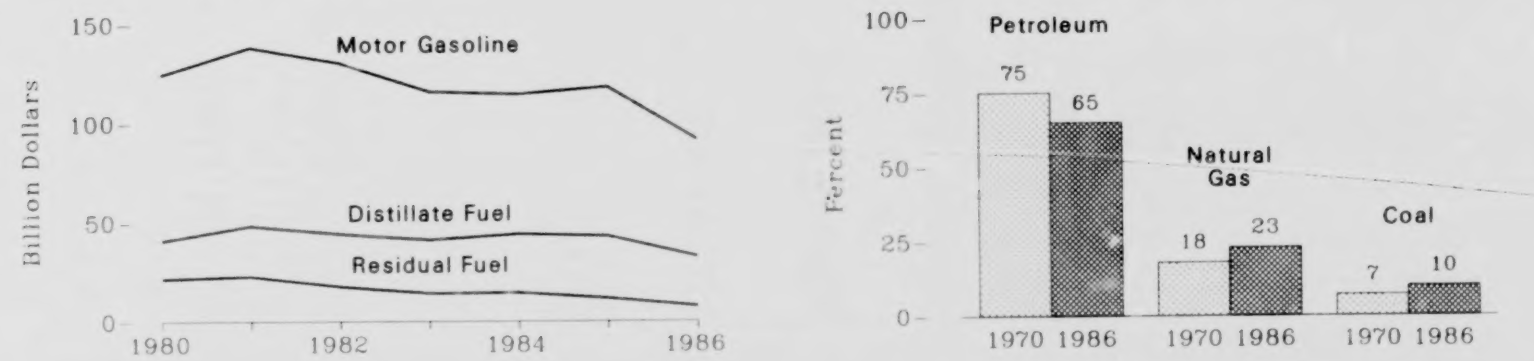
Sources: **Residential and Commercial Sector:** Energy Information Administration, "State Energy Price and Expenditure Data System 1986." **All Other Data:** Energy Information Administration, *State Energy Price and Expenditure Report 1986* (October 1988).

Figure 29. Energy Expenditure Estimates

Total Energy Expenditures, 1980-1986 | **Expenditures for Fossil Fuels, 1980-1986**



Expenditures for Selected Petroleum Products, 1980-1986 | **Fossil Fuel Shares of Primary Energy Expenditures, 1970 and 1986**



Source: See Table 29.

Table 29. Energy Expenditure Estimates, 1970, 1975, and 1980-1986

(Billion Dollars)

Energy Source	1970	1975	1980	1981	1982	1983	1984	1985	1986
Coal									
Coking Coal	1.2	3.7	3.7	3.8	2.7	2.2	2.5	2.2	1.8
Steam Coal	3.4	9.4	18.9	22.4	23.7	24.9	26.6	27.5	26.1
Total	4.6	13.0	22.6	26.2	26.4	27.1	29.1	29.7	27.9
Natural Gas	11.2	21.3	53.3	63.1	71.8	75.2	80.8	76.0	61.9
Petroleum Products									
Asphalt and Road Oil	0.7	1.9	3.5	4.2	3.5	3.9	4.5	4.9	4.7
Aviation Gasoline	0.3	0.4	0.9	0.9	0.8	0.8	0.7	0.8	0.9
Distillate Fuel Oil	6.3	15.7	40.8	48.2	44.1	41.1	44.0	42.9	32.5
Jet Fuel	1.4	4.2	13.9	15.6	15.0	13.9	15.1	14.7	10.5
Kerosene	0.6	0.9	2.3	2.2	2.3	2.0	1.9	1.8	1.0
Liquefied Petroleum Gases	2.4	5.2	10.9	11.9	12.9	14.1	14.3	13.7	12.8
Lubricants	1.5	2.3	5.1	6.1	5.3	5.5	6.1	5.7	4.9
Motor Gasoline	31.6	59.4	124.4	138.1	130.3	115.8	114.4	118.0	91.5
Residual Fuel Oil	2.0	10.4	21.6	22.7	17.6	14.1	14.4	11.5	7.5
Other Petroleum Products [1]	1.1	3.6	16.6	16.9	12.0	10.1	11.2	10.1	6.8
Total	48.2	104.1	240.0	266.8	244.0	221.3	226.8	224.3	173.2
Nuclear Fuel, Wood, and Waste Electricity Generation	(2)	0.5	1.2	1.4	1.7	1.8	2.4	2.9	3.1
Imports of Coal Coke	(2)	0.2	0.1	(2)	(2)	(2)	(2)	(2)	(2)
Exports of Coal Coke [3]	0.1	0.1	0.1	0.1	0.1	(2)	0.1	0.1	0.1
Total Primary Energy	64.0	139.0	317.1	354.5	343.8	325.3	339.0	332.9	266.1
Electric Utility Fuel [3]	4.3	16.4	37.4	43.3	41.3	41.3	43.3	42.5	35.8
Electricity Purchased by End Users [4]	23.4	50.7	98.1	116.5	127.4	134.7	147.9	154.5	150.2
Total Energy [5]	83.1	173.3	377.7	430.7	429.9	418.7	443.5	444.9	380.5

[1] Includes pentanes plus, petrochemical feedstocks, special naphthas, petroleum coke, still gas, wax, and miscellaneous products.

[2] Less than $0.05 billion.

[3] In determining total energy expenditures, this is a negative quantity.

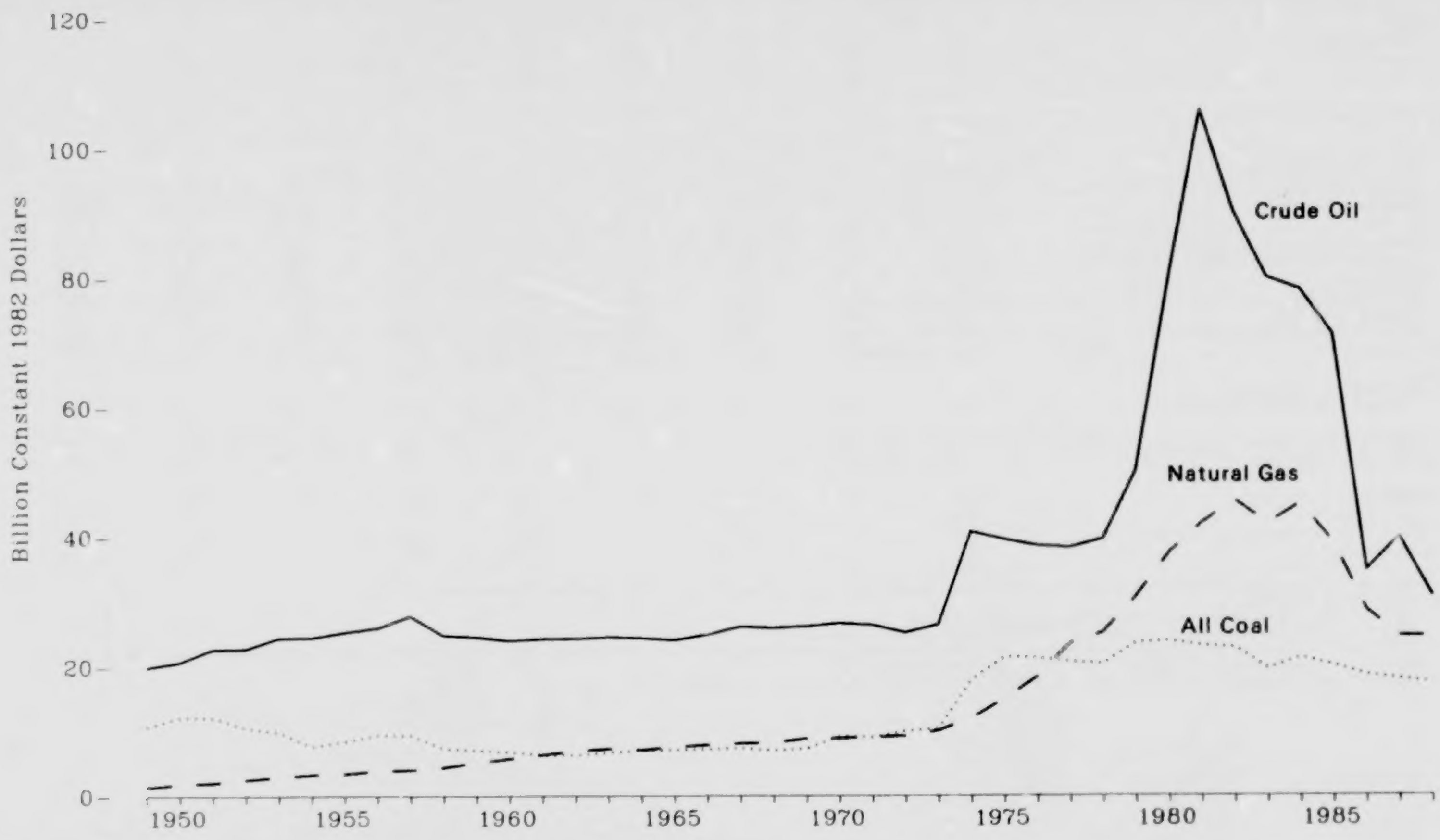
[4] These are sales. In determining total energy expenditures, this is a positive quantity.

[5] There are no direct fuel costs for hydroelectric, geothermal, centralized solar, or wind energy. Wood and other biomass fuels are not included, except those consumed at the electric utilities.

Note: Sum of components may not equal total due to independent rounding.

Source: Energy Information Administration, *State Energy Price and Expenditure Report 1986* (October 1988).

Figure 30. Value of Fossil Fuel Production, 1949–1988



Source: See Table 30.

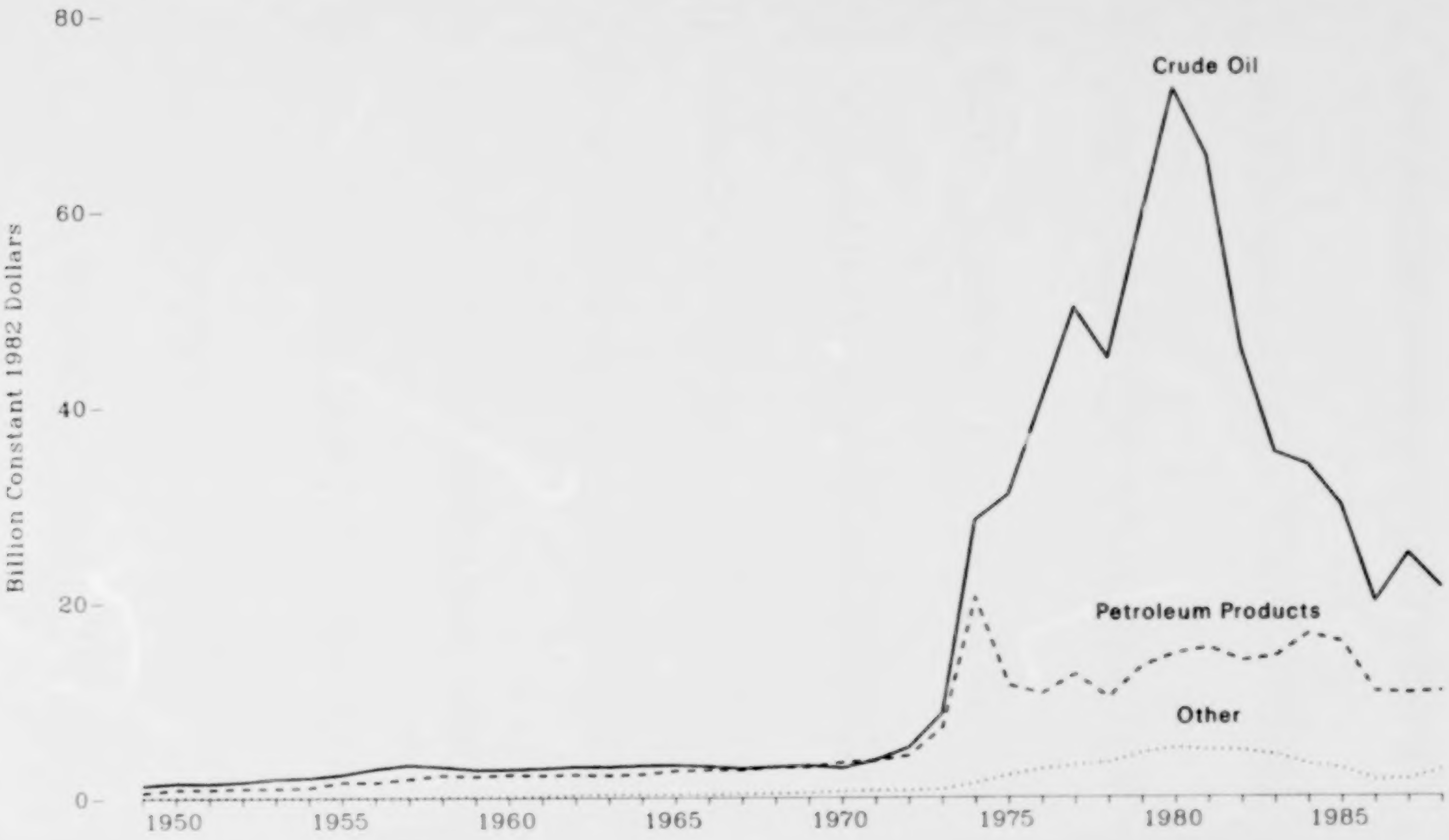
Table 30. Value of Fossil Fuel Production, 1949-1988

(Billion Dollars)

Year	Crude Oil [1]		Natural Gas (Marketed Production)		Bituminous Coal, Subbituminous Coal, and Lignite		Anthracite		Total	
	Current	Constant [2]	Current	Constant [2]	Current	Constant [2]	Current	Constant [2]	Current	Constant [2]
1949	4.68	19.91	0.33	1.40	2.14	9.11	0.38	1.62	7.53	32.04
1950	4.95	20.71	0.44	1.84	2.50	10.46	0.41	1.72	8.30	34.73
1951	5.69	22.67	0.52	2.07	2.63	10.48	0.42	1.67	9.26	36.89
1952	5.79	22.71	0.64	2.51	2.29	8.98	0.39	1.53	9.11	35.73
1953	6.32	24.40	0.76	2.93	2.25	8.69	0.31	1.20	9.64	37.22
1954	6.44	24.49	0.87	3.31	1.77	6.73	0.25	0.95	9.33	35.48
1955	6.88	25.29	0.94	3.46	2.09	7.68	0.21	0.77	10.12	37.20
1956	7.30	25.98	1.11	3.95	2.41	8.58	0.24	0.85	11.06	39.36
1957	8.09	27.80	1.17	4.02	2.50	8.59	0.23	0.79	11.99	41.20
1958	7.37	24.81	1.32	4.44	1.99	6.70	0.19	0.64	10.87	36.59
1959	7.47	24.57	1.57	5.16	1.97	6.48	0.18	0.59	11.19	36.80
1960	7.42	24.01	1.79	5.79	1.95	6.31	0.15	0.49	11.31	36.60
1961	7.58	24.29	1.99	6.38	1.85	5.93	0.14	0.45	11.56	37.05
1962	7.76	24.33	2.22	6.96	1.89	5.92	0.13	0.41	12.00	37.62
1963	7.96	24.57	2.36	7.28	2.01	6.20	0.16	0.49	12.49	38.54
1964	8.03	24.41	2.33	7.08	2.17	6.60	0.15	0.46	12.68	38.55
1965	8.15	24.11	2.57	7.60	2.27	6.72	0.13	0.38	13.12	38.81
1966	8.72	24.91	2.75	7.86	2.42	6.91	0.10	0.29	13.99	39.97
1967	9.39	26.16	2.91	8.11	2.55	7.10	0.10	0.28	14.95	41.65
1968	9.79	25.97	3.09	8.20	2.55	6.76	0.10	0.27	15.53	41.20
1969	10.42	26.18	3.52	8.84	2.80	7.04	0.10	0.25	16.84	42.31
1970	11.19	26.64	3.73	8.88	3.77	8.98	0.11	0.26	18.80	44.76
1971	11.71	26.37	4.05	9.12	3.90	8.78	0.11	0.25	19.77	44.52
1972	11.71	25.18	4.28	9.20	4.56	9.81	0.09	0.19	20.64	44.38
1973	13.07	26.40	4.98	10.06	5.05	10.20	0.09	0.18	23.19	46.84
1974	22.00	40.74	6.48	12.00	9.50	17.59	0.15	0.28	38.13	70.61
1975	23.45	39.54	8.85	14.92	12.47	21.03	0.20	0.34	44.97	75.83
1976	24.37	38.62	11.57	18.34	13.19	20.90	0.21	0.33	49.34	78.19
1977	25.79	38.32	15.82	23.51	13.70	20.36	0.20	0.30	55.51	82.49
1978	28.60	39.61	18.18	25.18	14.49	20.07	0.18	0.25	61.45	85.11
1979	39.45	50.19	24.16	30.74	18.36	23.36	0.20	0.25	82.17	104.54
1980	67.93	79.26	32.09	37.44	20.20	23.57	0.26	0.30	120.48	140.57
1981	99.40	105.74	39.51	42.03	21.51	22.88	0.24	0.26	160.66	170.91
1982	90.03	90.03	45.56	45.56	22.62	22.62	0.23	0.23	158.44	158.44
1983	83.05	79.93	43.57	41.93	20.11	19.36	0.21	0.20	146.94	141.42
1984	84.10	78.09	48.49	45.02	22.75	21.12	0.20	0.19	155.54	144.42
1985	78.88	71.13	43.17	38.93	22.06	19.89	0.22	0.20	144.33	130.15
1986	39.63	34.79	32.57	28.60	21.00	18.44	0.19	0.17	93.39	82.00
1987	46.93	39.87	28.97	24.61	21.05	17.88	0.16	0.14	97.11	82.50
1988[3]	37.40	30.73	29.91	24.58	21.02	17.27	0.15	0.12	88.48	72.70

[1] Includes lease condensate.
[2] In 1982 dollars, calculated using implicit GNP price deflators.
[3] Preliminary.
Note: Value is based on fuel prices taken as close as possible to the point of production.
Sources: Tables 49, 63, 68, 74, 77, and 83 and Appendix C.

Figure 31. Value of Fossil Fuel Imports, 1949–1988



Source: See Table 31.

Table 31. Value of Fossil Fuel Imports, 1949-1988

(Billion Dollars)

Year	Coal		Coal Coke		Natural Gas		Crude Oil [1]		Petroleum Products		Total	
	Current	Constant [2]	Current	Constant [2]	Current	Constant [2]	Current	Constant [2]	Current	Constant [2]	Current	Constant [2]
1949	(3)	0.01	(3)	0.02	(3)	(3)	0.30	1.30	0.14	0.58	0.45	1.91
1950	(3)	0.01	0.01	0.02	(3)	(3)	0.37	1.54	0.21	0.90	0.59	2.48
1951	(3)	0.01	(3)	0.01	(3)	(3)	0.37	1.49	0.23	0.90	0.61	2.41
1952	(3)	0.01	(3)	0.02	(3)	(3)	0.42	1.66	0.25	0.99	0.68	2.68
1953	(3)	0.01	(3)	0.01	(3)	(3)	0.51	1.97	0.25	0.97	0.77	2.96
1954	(3)	0.01	(3)	(3)	(3)	(3)	0.54	2.07	0.28	1.08	0.83	3.17
1955	(3)	0.01	(3)	0.01	(3)	(3)	0.65	2.41	0.44	1.62	1.10	4.05
1956	(3)	0.01	(3)	0.01	(3)	(3)	0.84	2.98	0.45	1.59	1.29	4.59
1957	(3)	0.01	(3)	0.01	(3)	0.01	0.98	3.37	0.57	1.95	1.56	5.35
1958	(3)	0.01	(3)	0.01	0.02	0.07	0.94	3.16	0.68	2.31	1.65	5.56
1959	(3)	0.01	(3)	(3)	0.03	0.09	0.87	2.87	0.66	2.18	1.57	5.15
1960	(3)	0.01	(3)	(3)	0.03	0.09	0.90	2.90	0.73	2.37	1.66	5.37
1961	(3)	(3)	(3)	(3)	0.04	0.14	0.93	2.99	0.71	2.28	1.69	5.42
1962	(3)	0.01	(3)	0.01	0.09	0.27	1.01	3.17	0.75	2.36	1.86	5.82
1963	(3)	0.01	(3)	0.01	0.10	0.30	1.03	3.16	0.74	2.28	1.87	5.76
1964	(3)	0.01	(3)	(3)	0.10	0.30	1.08	3.28	0.78	2.38	1.97	5.98
1965	(3)	(3)	(3)	(3)	0.11	0.31	1.12	3.31	0.92	2.73	2.15	6.37
1966	(3)	(3)	(3)	0.01	0.11	0.30	1.12	3.19	0.99	2.82	2.21	6.32
1967	(3)	0.01	(3)	(3)	0.13	0.36	1.06	2.96	1.02	2.83	2.21	6.17
1968	(3)	0.01	(3)	0.01	0.15	0.39	1.18	3.14	1.16	3.09	2.50	6.63
1969	(3)	(3)	(3)	0.01	0.20	0.49	1.30	3.26	1.24	3.11	2.74	6.88
1970	(3)	(3)	(3)	0.01	0.26	0.61	1.26	3.00	1.48	3.53	3.00	7.15
1971	(3)	(3)	0.01	0.01	0.31	0.70	1.69	3.80	1.66	3.73	3.66	8.25
1972	(3)	(3)	(3)	0.01	0.31	0.68	2.37	5.10	1.99	4.28	4.68	10.06
1973	(3)	(3)	0.04	0.08	0.36	0.73	4.24	8.57	3.50	7.07	8.14	16.45
1974	0.06	0.11	0.19	0.36	0.53	0.98	15.25	28.25	11.01	20.39	27.05	50.09
1975	0.02	0.04	0.16	0.26	1.15	1.94	18.29	30.84	6.77	11.41	26.39	44.50
1976	0.02	0.03	0.11	0.18	1.66	2.63	25.46	40.34	6.65	10.54	33.90	53.72
1977	0.04	0.06	0.13	0.19	2.00	2.97	33.59	49.91	8.42	12.51	44.18	65.64
1978	0.07	0.10	0.41	0.57	2.06	2.85	32.30	44.73	7.30	10.12	42.15	58.37
1979	0.05	0.07	0.34	0.43	3.13	3.98	46.06	58.60	10.45	13.30	60.03	76.37
1980	0.03	0.04	0.05	0.06	4.21	4.92	61.90	72.23	12.54	14.63	78.74	91.87
1981	0.03	0.03	0.04	0.05	4.41	4.69	61.46	65.38	14.30	15.21	80.24	85.36
1982	0.02	0.02	0.01	0.01	4.69	4.69	45.72	45.72	13.86	13.86	64.31	64.31
1983	0.04	0.04	(3)	(3)	4.39	4.22	36.49	35.12	14.84	14.28	55.77	53.67
1984	0.05	0.04	0.05	0.04	3.44	3.19	36.44	33.84	17.87	16.59	57.84	53.71
1985	0.07	0.06	0.04	0.04	3.05	2.75	32.90	29.67	17.47	15.75	53.53	48.27
1986	0.08	0.07	0.03	0.02	1.82	1.60	22.61	19.85	12.18	10.69	36.72	32.24
1987	0.06	0.05	0.05	0.05	1.93	1.64	29.13	24.75	12.37	10.51	43.54	36.99
1988[4]	0.06	0.05	0.19	0.16	3.01	2.47	25.84	21.24	13.01	10.69	42.12	34.61

[1] Includes imports into the Strategic Petroleum Reserve, which began in 1977.

[2] In 1982 dollars, calculated using implicit GNP price deflators. See Appendix C.

[3] Less than $5 million.

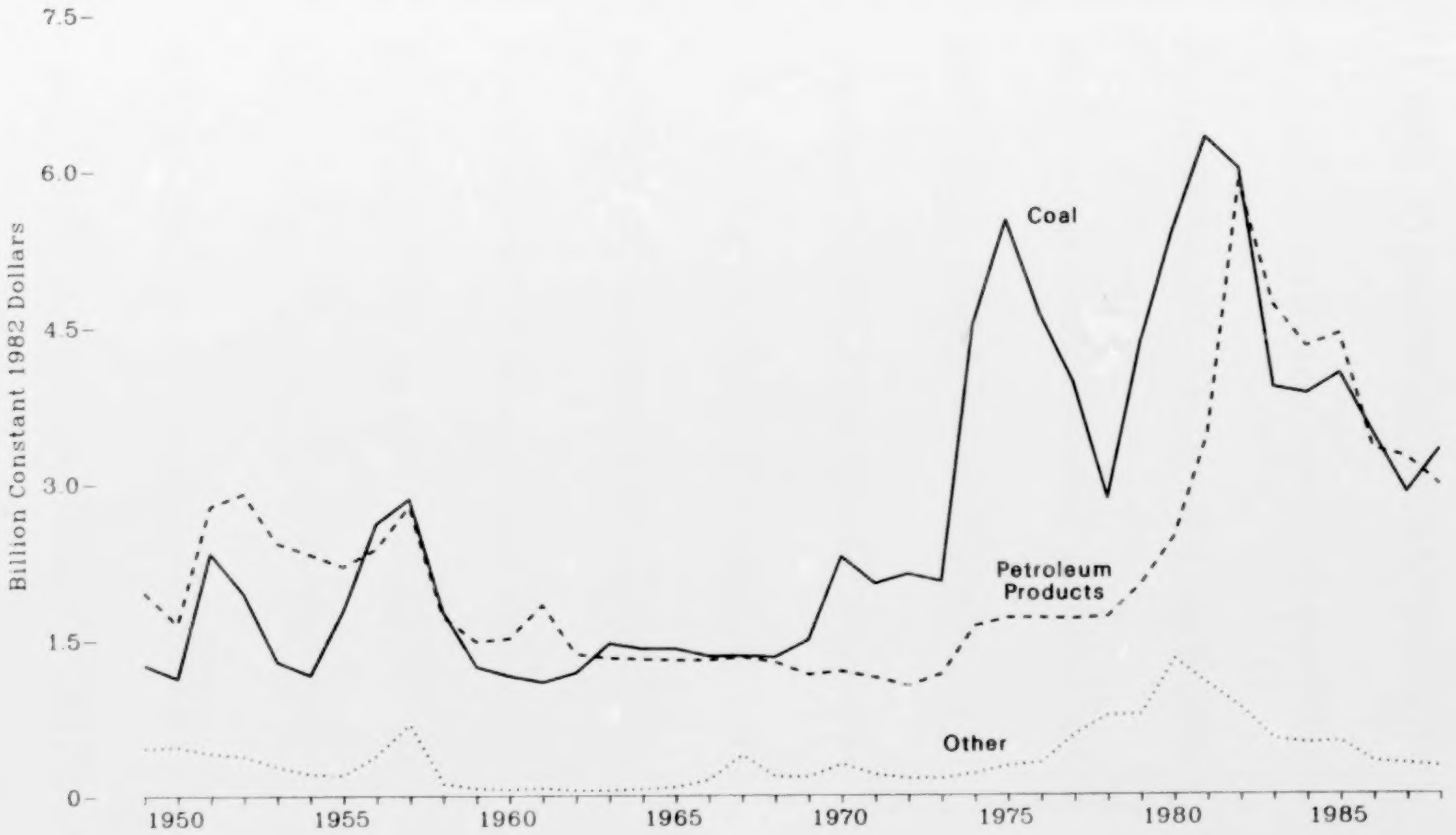
[4] Preliminary.

Note: Sum of components may not equal total due to independent rounding.

Note: Includes value of imports into Puerto Rico from foreign countries; excludes receipts into the 50 States and the District of Columbia from the Virgin Islands and Puerto Rico.

Sources: **Natural Gas:** • 1949 through 1962—Bureau of the Census, *U.S. Imports of Merchandise for Consumption*, FT110. •1963—Bureau of the Census, *U.S. Imports of Merchandise for Consumption*, FT125. •1964 through 1971—Bureau of the Census, *U.S. Imports for Consumption and General Imports*, FT246. • 1972 and 1973—Federal Power Commission, *Pipeline Imports and Exports of Natural Gas - Imports and Exports of LNG*. • 1974 through 1977—Federal Power Commission, *United States Imports and Exports of Natural Gas*, annual. • 1978 through 1981—Energy Information Administration, *U.S. Imports and Exports of Natural Gas*, annual. • 1982 through 1987—Energy Information Administration, *Natural Gas Monthly*. • 1988—EIA estimates. **Others:** • 1949 through 1962—Bureau of the Census, *U.S. Imports of Merchandise for Consumption*, FT110. •1963—Bureau of the Census *U.S. Imports of Merchandise for Consumption*, FT125. • 1964 through 1987—Bureau of the Census, *U.S. Imports for Consumption*, FT135. • 1988—Bureau of the Census, *Advanced Report on U.S. Merchandise Trade*, FT900 Adv. (88-12).

Figure 32. Value of Fossil Fuel Exports, 1949-1988



Source: See Table 32.

Table 32. Value of Fossil Fuel Exports, 1949-1988

(Billion Dollars)

Year	Coal		Coal Coke		Natural Gas		Crude Oil		Petroleum Products		Total	
	Current	Constant [1]	Current	Constant [1]	Current	Constant [1]	Current	Constant [1]	Current	Constant [1]	Current	Constant [1]
1949	0.30	1.26	0.01	0.04	(2)	0.01	0.10	0.42	0.46	1.96	0.87	3.69
1950	0.27	1.13	0.01	0.03	(2)	0.01	0.10	0.43	0.39	1.65	0.78	3.25
1951	0.59	2.33	0.02	0.07	(2)	0.01	0.08	0.33	0.70	2.78	1.39	5.53
1952	0.49	1.94	0.01	0.05	(2)	0.02	0.08	0.31	0.74	2.90	1.33	5.21
1953	0.34	1.29	0.01	0.04	(2)	0.02	0.06	0.23	0.63	2.43	1.04	4.01
1954	0.30	1.16	0.01	0.02	(2)	0.02	0.05	0.17	0.61	2.32	0.97	3.68
1955	0.48	1.78	0.01	0.03	0.01	0.02	0.04	0.14	0.60	2.20	1.14	4.18
1956	0.73	2.61	0.01	0.04	0.01	0.03	0.09	0.32	0.67	2.37	1.51	5.37
1957	0.83	2.85	0.01	0.05	0.01	0.04	0.17	0.60	0.81	2.78	1.84	6.31
1958	0.53	1.77	0.01	0.02	0.01	0.05	0.01	0.05	0.51	1.72	1.07	3.61
1959	0.38	1.24	0.01	0.03	0.01	0.02	0.01	0.02	0.45	1.48	0.85	2.80
1960	0.35	1.15	0.01	0.02	(2)	0.01	0.01	0.03	0.47	1.51	0.84	2.72
1961	0.34	1.09	0.01	0.03	(2)	0.01	0.01	0.03	0.57	1.83	0.93	2.99
1962	0.38	1.18	0.01	0.02	(2)	0.01	0.01	0.02	0.43	1.36	0.83	2.59
1963	0.47	1.46	0.01	0.03	(2)	0.01	(2)	0.01	0.43	1.32	0.92	2.84
1964	0.46	1.41	0.01	0.03	(2)	0.01	(2)	0.01	0.43	1.31	0.91	2.77
1965	0.48	1.41	0.02	0.05	0.01	0.02	(2)	0.01	0.44	1.30	0.95	2.80
1966	0.47	1.34	0.02	0.07	0.02	0.05	0.01	0.03	0.46	1.30	0.97	2.79
1967	0.48	1.34	0.02	0.05	0.03	0.09	0.09	0.26	0.48	1.33	1.10	3.07
1968	0.50	1.33	0.02	0.05	0.04	0.10	0.01	0.03	0.48	1.28	1.05	2.79
1969	0.59	1.49	0.04	0.10	0.03	0.07	0.01	0.02	0.46	1.16	1.13	2.83
1970	0.96	2.29	0.08	0.19	0.03	0.07	0.02	0.04	0.50	1.19	1.59	3.79
1971	0.90	2.03	0.04	0.10	0.04	0.09	0.01	0.01	0.50	1.13	1.49	3.36
1972	0.98	2.12	0.03	0.07	0.04	0.09	(2)	(2)	0.49	1.05	1.55	3.32
1973	1.01	2.05	0.03	0.07	0.04	0.08	(2)	0.01	0.57	1.16	1.66	3.36
1974	2.44	4.51	0.04	0.08	0.05	0.10	0.01	0.03	0.87	1.62	3.42	6.34
1975	3.26	5.50	0.07	0.13	0.09	0.15	(2)	(2)	1.01	1.70	4.43	7.47
1976	2.91	4.61	0.07	0.11	0.10	0.16	0.03	0.04	1.07	1.70	4.17	6.62
1977	2.66	3.95	0.07	0.11	0.11	0.16	0.21	0.31	1.14	1.69	4.18	6.21
1978	2.05	2.84	0.05	0.07	0.11	0.15	0.39	0.54	1.23	1.71	3.83	5.31
1979	3.40	4.32	0.08	0.10	0.13	0.16	0.39	0.50	1.58	2.02	5.58	7.10
1980	4.63	5.40	0.13	0.15	0.23	0.27	0.75	0.88	2.12	2.47	7.86	9.17
1981	5.92	6.29	0.07	0.08	0.35	0.37	0.58	0.61	3.24	3.44	10.16	10.80
1982	5.99	5.99	0.06	0.06	0.30	0.30	0.47	0.47	5.86	5.86	12.68	12.68
1983	4.06	3.90	0.05	0.04	0.28	0.27	0.22	0.22	4.88	4.69	9.48	9.13
1984	4.13	3.84	0.07	0.06	0.27	0.25	0.19	0.17	4.62	4.29	9.27	8.61
1985	4.47	4.03	0.08	0.07	0.26	0.24	0.23	0.20	4.90	4.41	9.93	8.95
1986	3.93	3.45	0.07	0.06	0.17	0.15	0.12	0.10	3.77	3.31	8.05	7.07
1987	3.40	2.89	0.05	0.04	0.17	0.14	0.13	0.11	3.80	3.23	7.54	6.41
1988[3]	4.01	3.30	0.08	0.06	0.17	0.14	0.08	0.06	3.60	2.96	7.94	6.52

[1] In 1982 dollars, calculated using implicit GNP price deflators. See Appendix C.

[2] Less than $5 million.

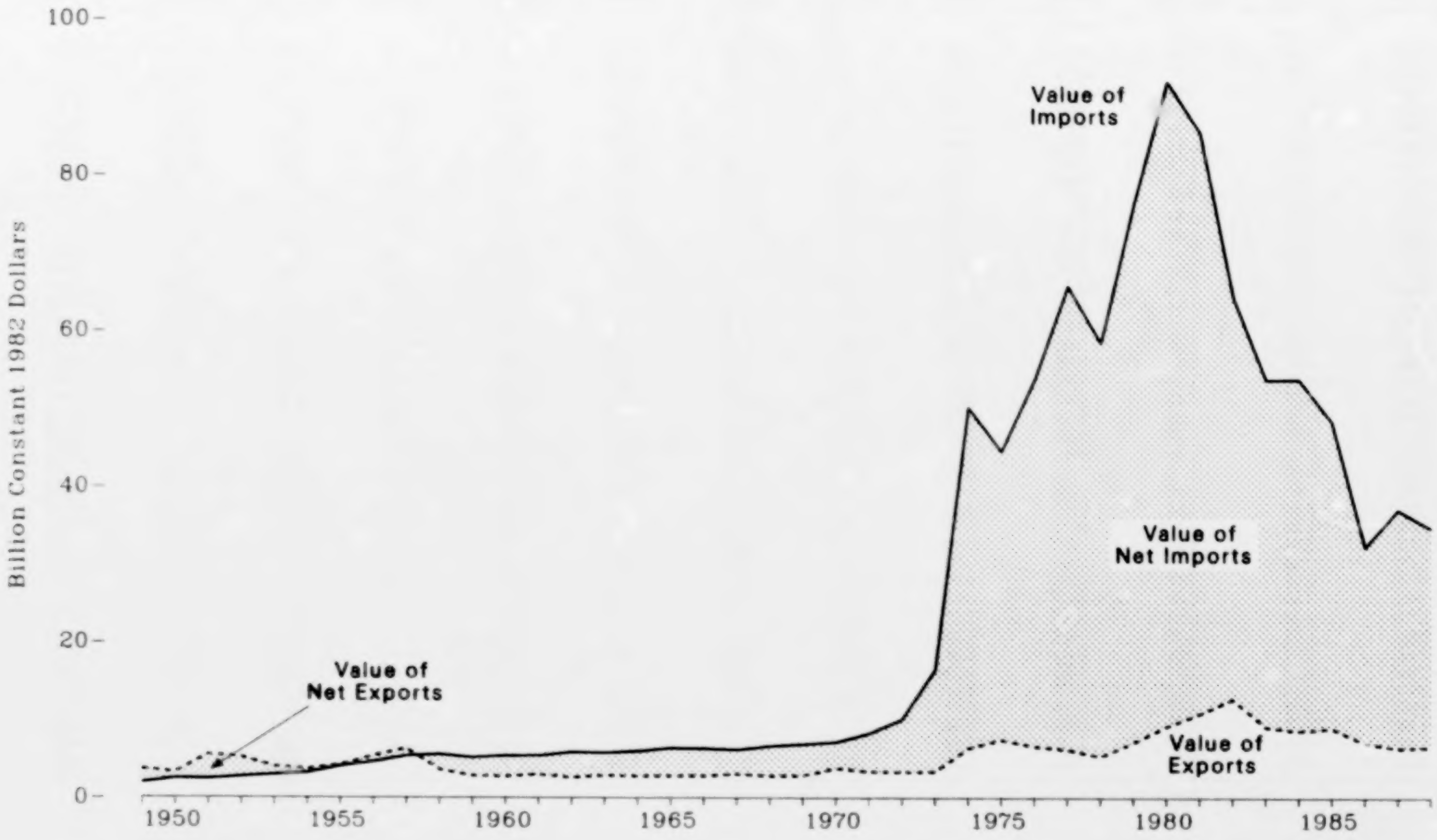
[3] Preliminary.

Note: Includes value of exports from Puerto Rico to foreign countries; excludes shipments from the 50 States and the District of Columbia to the Virgin Islands and Puerto Rico.

Note: Sum of components may not equal total due to independent rounding.

Sources: **Natural Gas:** •1949 through 1971—Bureau of the Census, *U.S. Exports*, FT410. •1972 and 1973—Federal Power Commission, *Pipeline Imports and Exports of Natural Gas - Imports and Exports of LNG.* • 1974 through 1977—Federal Power Commission, *United States Imports and Exports of Natural Gas*, annual. • 1978 through 1981—Energy Information Administration, *U.S. Imports and Exports of Natural Gas*, annual. • 1982 through 1987—Energy Information Administration, *Natural Gas Monthly*. • 1988—EIA estimates. **Others:** • 1949 through 1987—Bureau of the Census, *U.S. Exports*, FT410. •1988—Bureau of the Census, *Advanced Report on U.S. Merchandise Trade*, FT900 Adv. (88-12).

Figure 33. Value of Fossil Fuel Net Imports, 1949–1988



Source: See Tables 31, 32, and 33.

Table 33. Value of Fossil Fuel Net Imports[1], 1949-1988

(Billion Dollars)

Year	Coal		Coal Coke		Natural Gas		Crude Oil		Petroleum Products		Total	
	Current	Constant[2]	Current	Constant[2]	Current	Constant[2]	Current	Constant[2]	Current	Constant[2]	Current	Constant[2]
1949	-0.29	-1.25	(3)	-0.02	(3)	-0.01	0.21	0.88	-0.32	-1.38	-0.42	-1.78
1950	-0.27	-1.12	(3)	(3)	(3)	-0.01	0.27	1.12	-0.18	-0.75	-0.18	-0.77
1951	-0.58	-2.33	-0.02	-0.06	(3)	-0.01	0.29	1.17	-0.47	-1.88	-0.78	-3.12
1952	-0.49	-1.93	-0.01	-0.04	(3)	-0.01	0.34	1.35	-0.49	-1.91	-0.65	-2.53
1953	-0.33	-1.29	-0.01	-0.03	(3)	-0.01	0.45	1.74	-0.38	-1.46	-0.27	-1.05
1954	-0.30	-1.15	(3)	-0.02	(3)	-0.01	0.50	1.90	-0.32	-1.24	-0.14	-0.52
1955	-0.48	-1.77	-0.01	-0.03	-0.01	-0.02	0.62	2.27	-0.16	-0.58	-0.04	-0.13
1956	-0.73	-2.60	-0.01	-0.04	-0.01	-0.03	0.75	2.66	-0.22	-0.78	-0.22	-0.78
1957	-0.83	-2.84	-0.01	-0.04	-0.01	-0.03	0.81	2.77	-0.24	-0.83	-0.28	-0.97
1958	-0.52	-1.76	-0.01	-0.02	0.01	0.02	0.92	3.11	0.17	0.59	0.58	1.94
1959	-0.38	-1.24	-0.01	-0.02	0.02	0.07	0.87	2.85	0.21	0.70	0.71	2.35
1960	-0.35	-1.14	-0.01	-0.02	0.02	0.08	0.89	2.87	0.26	0.86	0.82	2.65
1961	-0.34	-1.09	-0.01	-0.02	0.04	0.13	0.92	2.96	0.14	0.44	0.76	2.43
1962	-0.38	-1.18	-0.01	-0.02	0.08	0.26	1.01	3.16	0.32	1.00	1.03	3.22
1963	-0.47	-1.45	-0.01	-0.02	0.09	0.29	1.02	3.15	0.31	0.95	0.95	2.92
1964	-0.46	-1.40	-0.01	-0.03	0.10	0.29	1.08	3.27	0.35	1.07	1.06	3.21
1965	-0.48	-1.41	-0.01	-0.04	0.10	0.29	1.11	3.30	0.48	1.43	1.21	3.57
1966	-0.47	-1.33	-0.02	-0.06	0.09	0.25	1.11	3.16	0.53	1.52	1.24	3.53
1967	-0.48	-1.34	-0.01	-0.04	0.10	0.27	0.97	2.71	0.54	1.50	1.11	3.10
1968	-0.50	-1.33	-0.02	-0.04	0.11	0.29	1.17	3.11	0.68	1.81	1.45	3.84
1969	-0.59	-1.49	-0.04	-0.09	0.17	0.42	1.29	3.25	0.78	1.95	1.61	4.05
1970	-0.96	-2.29	-0.08	-0.18	0.23	0.54	1.24	2.96	0.98	2.34	1.41	3.37
1971	-0.90	-2.03	-0.04	-0.09	0.27	0.62	1.68	3.79	1.15	2.60	2.17	4.89
1972	-0.98	-2.11	-0.03	-0.06	0.28	0.59	2.37	5.09	1.50	3.23	3.13	6.74
1973	-1.01	-2.04	0.01	0.01	0.32	0.65	4.24	8.56	2.93	5.91	6.48	13.09
1974	-2.38	-4.41	0.15	0.28	0.48	0.88	15.24	28.22	10.14	18.78	23.63	43.75
1975	-3.24	-5.46	0.08	0.14	1.06	1.79	18.29	30.84	5.76	9.72	21.96	37.03
1976	-2.89	-4.58	0.04	0.07	1.56	2.47	25.43	40.30	5.58	8.85	29.72	47.10
1977	-2.62	-3.89	0.06	0.09	1.89	2.81	33.38	49.60	7.28	10.82	40.00	59.43
1978	-1.98	-2.74	0.36	0.50	1.95	2.70	31.91	44.19	6.07	8.41	38.31	53.07
1979	-3.35	-4.26	0.26	0.33	3.00	3.81	45.66	58.10	8.87	11.28	54.44	69.26
1980	-4.60	-5.36	-0.08	-0.09	3.98	4.65	61.15	71.35	10.42	12.16	70.88	82.71
1981	-5.89	-6.26	-0.03	-0.03	4.06	4.32	60.88	64.77	11.06	11.77	70.09	74.56
1982	-5.97	-5.97	-0.05	-0.05	4.39	4.39	45.25	45.25	8.00	8.00	51.63	51.63
1983	-4.01	-3.86	-0.04	-0.04	4.11	3.96	36.27	34.91	9.96	9.59	46.28	44.55
1984	-4.09	-3.79	-0.02	-0.02	3.17	2.94	36.26	33.67	13.25	12.30	48.57	45.10
1985	-4.39	-3.96	-0.03	-0.03	2.79	2.51	32.68	29.46	12.57	11.33	43.60	39.32
1986	-3.85	-3.38	-0.04	-0.04	1.65	1.45	22.49	19.75	8.42	7.39	28.67	25.17
1987	-3.35	-2.85	0.01	0.01	1.76	1.50	29.00	24.64	8.57	7.28	36.00	30.58
1988[4]	-3.95	-3.24	0.12	0.10	2.84	2.33	25.77	21.17	9.41	7.73	34.18	28.09

[1] Net imports = imports minus exports.

[2] In 1982 dollars, calculated using implicit GNP price deflators. See Appendix C.

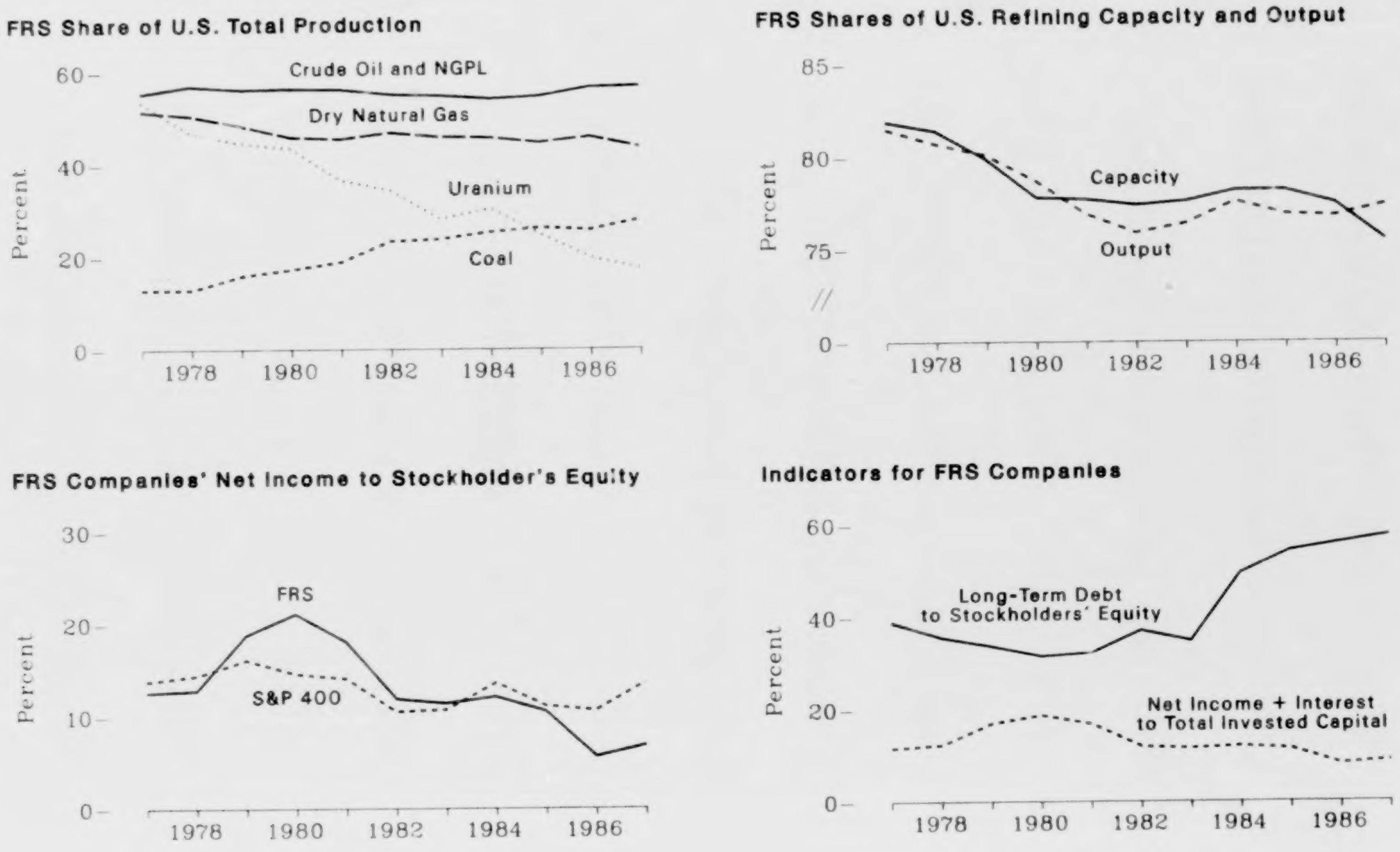
[3] Less than $5 million.

[4] Preliminary.

Note: Sum of components may not equal total due to independent rounding. Data on this table may not equal data on Table 31 minus data on Table 32 due to independent rounding.

Sources: Tables 31 and 32.

Figure 34. Selected Statistics for FRS* Companies' Operations, 1977-1987



FRS Share of U.S. Total Production

FRS Shares of U.S. Refining Capacity and Output

FRS Companies' Net Income to Stockholder's Equity

Indicators for FRS Companies

*FRS = Financial Reporting System (see Appendix E, Note 3).
Source: See Table 34

Table 34. Selected Statistics for FRS[1] Companies' Operations, 1977-1987

Activity	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Production											
Crude Oil and NGL[2] (million barrels)	1,991.2	2,131.4	2,081.7	2,087.5	2,072.4	2,079.1	2.059.3	2,088.8	2,120.5	2,089.6	2,069.5
(Percent of U.S. Total)	(55.3)	(56.9)	(56.2)	(56.3)	(56.2)	(55.1)	(54.8)	(54.1)	(54.6)	(56.5)	(56.7)
Dry Natural Gas (trillion cubic feet)	10.3	10.1	9.9	9.3	9.2	8.3	7.4	7.9	7.3	7.1	7.2
(Percent of U.S. Total)	(51.5)	(50.5)	(48.4)	(45.9)	(45.5)	(46.8)	(45.9)	(45.7)	(44.6)	(45.8)	(43.6)
Bituminous Coal[3] and Lignite (million short tons)	89.1	85.5	123.3	142.3	154.8	195.2	185.2	226.0	230.4	227.6	255.3
(Percent of U.S. Total)	(12.9)	(12.9)	(15.9)	(17.3)	(18.9)	(23.4)	(23.8)	(25.3)	(26.2)	(25.7)	(27.9)
Uranium (million pounds of U_3O_8)	16.0	17.3	16.7	19.0	14.5	9.2	6.6	4.1	2.1	1.6	2.3
(Percent of U.S. Total)	(53.5)	(46.8)	(44.6)	(43.5)	(36.6)	(34.3)	(28.1)	(30.4)	(24.8)	(19.7)	(17.4)
Refining											
Capacity[4] (million barrels per day)	14.6	14.8	14.4	15.1	14.6	13.6	13.0	12.8	12.6	12.5	12.5
(Percent of U.S. Total)	(81.9)	(81.4)	(79.9)	(77.8)	(77.7)	(77.4)	(77.6)	(78.2)	(78.2)	(77.5)	(75.5)
Output (million barrels per day)	13.7	13.6	13.3	12.2	11.2	10.6	10.3	10.9	10.9	11.5	11.7
(Percent of U.S. Total)	(81.5)	(80.7)	(80.1)	(78.7)	(76.9)	(75.9)	(76.4)	(77.6)	(76.9)	(76.8)	(77.4)
Financial Indicators											
Net Income (billion dollars)	12.7	13.9	23.5	31.0	30.0	21.8	21.9	21.3	17.4	9.2	11.3
Net Income to Stockholders' Equity (percent)	12.6	12.8	18.8	21.1	18.1	11.9	11.4	12.1	10.5	5.6	6.8
Net Income to Stockholders' Equity for the Standard and Poors' 400 (percent)	13.8	14.4	16.1	14.6	14.1	10.5	10.7	13.6	11.1	10.6	13.6
Net Income Plus Interest to Total Invested Capital (percent)	11.6	12.3	16.9	18.7	16.8	11.9	11.5	12.0	11.4	8.1	8.8
Long-Term Debt to Stockholders' Equity (percent)	38.9	35.6	33.7	31.5	32.2	37.1	34.8	49.5	54.3	56.0	57.6

[1] FRS = Financial Reporting System (see Appendix E, Note 3).

[2] NGL = Natural Gas Liquids.

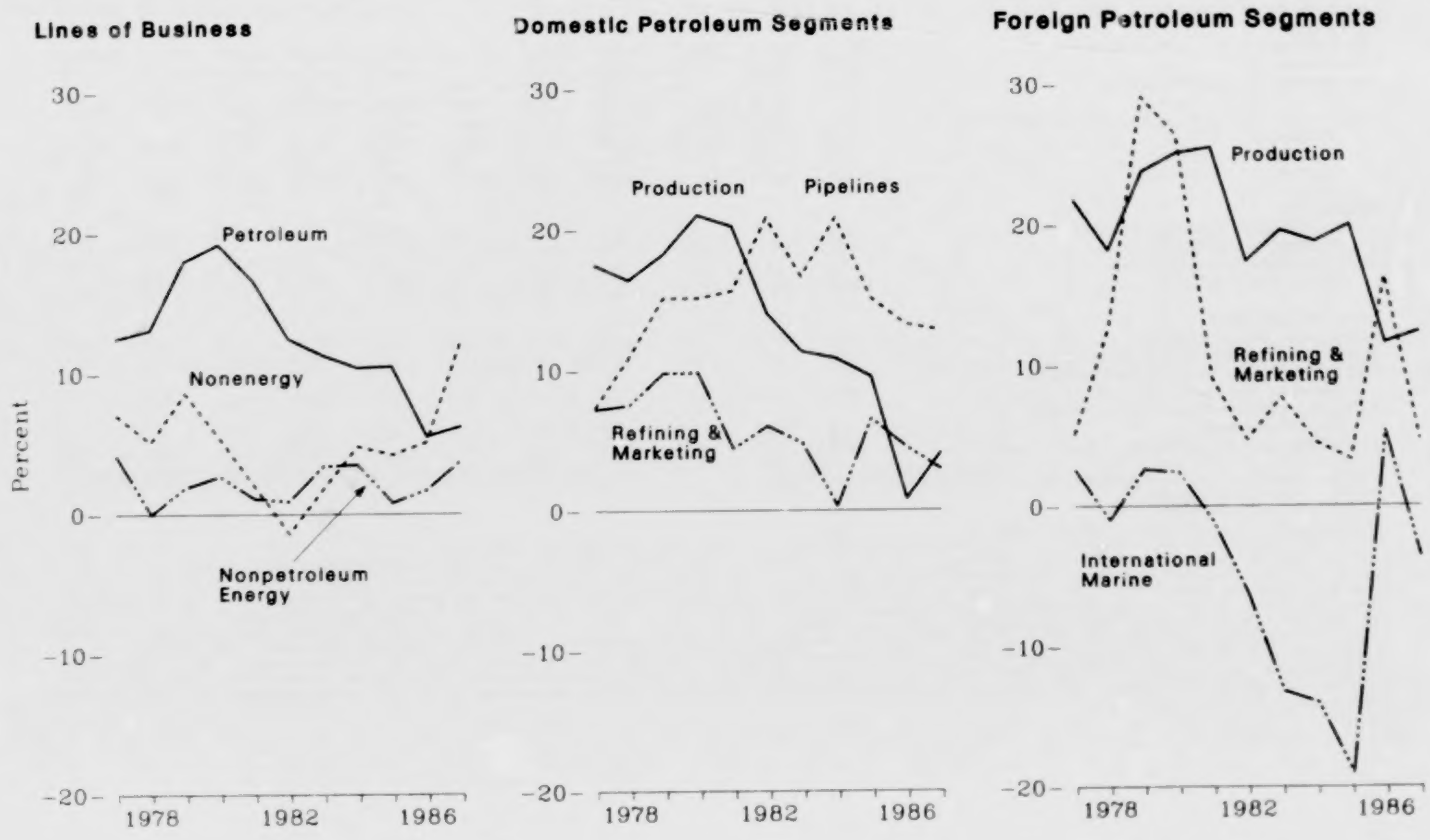
[3] Includes subbituminous coal.

[4] Operable capacity as of January 1 of the following year.

Note: FRS Crude Oil and NGL and Natural Gas (Dry Marketed) production are on a net ownership interest basis (see Glossary).

Sources: **FRS Companies:** Energy Information Administration, *Performance Profiles of Major Energy Producers.* **U.S. Total, Production: Crude Oil and NGL:** • 1977 through 1980—Energy Information Administration, Energy Data Reports, *Petroleum Statement, Annual.* • 1981 and forward—Energy Information Administration, *Petroleum Supply Annual.* **U.S. Total, Production: Dry Natural Gas:** • 1977 and 1978—Energy Information Administration, Energy Data Reports, *Natural Gas, Annual.* • 1979—Energy Information Administration, *Natural Gas Production and Consumption.* • 1980 and forward—Energy Information Administration, *Natural Gas Annual.* **U.S. Total, Production: Bituminous Coal and Lignite:** • 1977 through 1979—Energy Information Administration, Energy Data Report, *Bituminous Coal and Lignite Production and Mine Operations.* • 1980—Energy Information Administration, Energy Data Report, *Weekly Coal Report.* • 1981 and forward—Energy Information Administration, *Weekly Coal Production.* **U.S. Total, Production: Uranium.** • 1977 through 1981—U.S. Department of Energy, Grand Junction Office, Colorado, *Statistical Data of the Uranium Industry,* Report No. GJO-100, annual. •1982 and 1983—Energy Information Administration, *Survey of United States Uranium Marketing Activity.* •1984 and forward—Energy Information Administration, *Uranium Industry Annual* **U.S. Total, Refining:** • 1977 through 1980—Energy Information Administration, *Energy Company Development Patterns in the Postembargo Era,* Vol. 1. • 1981 and forward—Energy Information Administration, *Petroleum Supply Annual.*

Figure 35. Return on Investment* by Lines of Business of FRS** Companies, 1977-1987



*Net Income as a percent of net investment in place.
**FRS=Financial Reporting System (see Appendix E, Note 3).
Source: See Tables 34 and 35.

Table 35. Net Income of FRS [1] Companies, 1977-1987

(Billion Dollars)

Item	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Type of Business											
Petroleum and Natural Gas	13.0	14.7	23.0	29.1	29.5	25.0	24.0	23.6	24.8	12.9	14.8
Coal	0.2	0.1	0.3	0.3	0.4	0.4	0.5	0.6	0.4	0.2	0.4
Nuclear and Other Energy	([2])	-0.1	-0.1	([2])	-0.3	-0.3	([2])	-0.1	-0.3	([2])	([2])
Nonenergy	1.7	1.8	2.8	2.3	1.6	0.4	1.8	2.9	2.5	2.8	7.1
Eliminations and Nontraceables	-2.5	-2.7	-2.5	-0.6	-1.2	-3.7	-4.4	-5.7	-10.0	-6.8	-11.1
Total	12.7	13.9	23.5	31.0	30.0	21.8	21.9	21.3	17.4	9.2	11.3
Domestic Petroleum and Natural Gas											
Production	6.4	6.7	9.4	13.8	16.8	14.1	12.2	13.3	12.1	0.9	4.7
Refining/Marketing	1.5	1.6	2.3	2.5	1.3	1.9	1.6	0.1	2.3	1.6	1.1
Rate Regulated Pipelines	0.8	1.2	1.7	1.7	1.8	2.3	2.0	2.5	2.3	2.6	2.6
Eliminations and Nontraceables	-0.1	-0.1	([2])	-0.1	([2])	([2])	([2])	([2])	([2])	([2])	([2])
Total	8.6	9.5	13.4	17.9	19.9	18.3	15.9	15.8	16.7	5.2	8.4
Foreign Petroleum and Natural Gas											
Production	3.6	3.5	5.2	6.9	8.0	6.1	7.2	7.5	8.0	4.7	5.4
Refining/Marketing	0.7	1.8	4.3	4.3	1.6	0.8	1.3	0.7	0.5	2.9	1.0
International Marine	0.1	-0.1	0.1	0.1	-0.1	-0.3	-0.5	-0.4	-0.4	0.1	-0.1
Eliminations and Nontraceables	0.1	([2])	([2])	([2])	([2])	([2])	0.1	([2])	([2])	([2])	([2])
Total	4.4	5.2	9.7	11.2	9.6	6.7	8.2	7.8	8.1	7.7	6.4

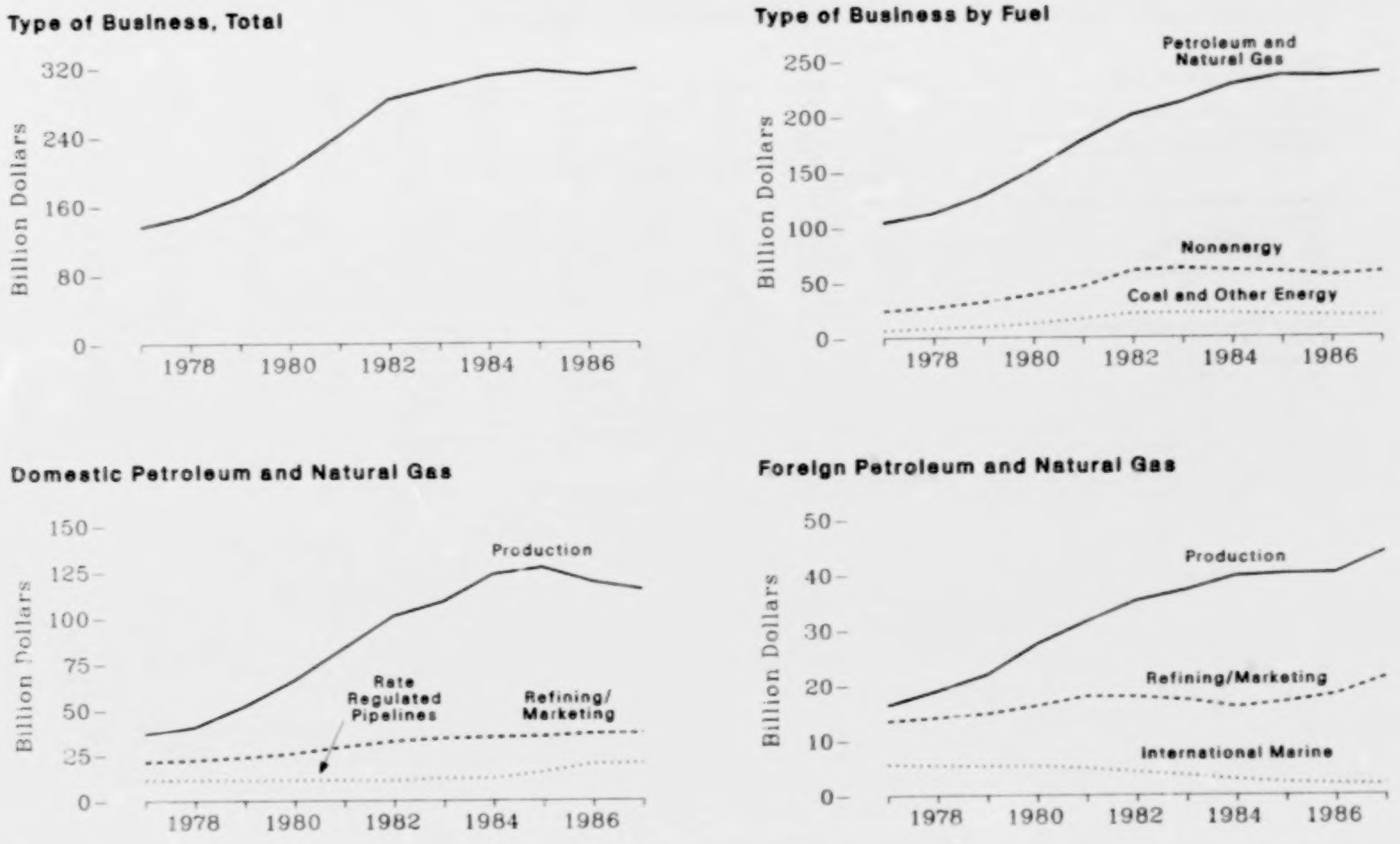
[1] FRS = Financial Reporting System (see Appendix E, Note 3).

[2] Less than $50 million in absolute value.

Note: Sum of components may not equal total due to independent rounding.

Source: Energy Information Administration, *Performance Profiles of Major Energy Producers*, various issues.

Figure 36. Net Investment in Place for FRS* Companies, 1977-1987



Type of Business, Total

Type of Business by Fuel

Domestic Petroleum and Natural Gas

Foreign Petroleum and Natural Gas

*FRS = Financial Reporting System (see Appendix E, Note 3).
Source: See Table 36.

Table 36. Net Investment in Place[1] for FRS[2] Companies, 1977-1987

(Billion Dollars)

Item	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Type of Business											
Petroleum and Natural Gas	104.2	112.2	128.3	151.4	178.0	200.7	212.2	227.8	236.2	235.4	238.7
Coal	2.8	3.3	4.1	5.0	7.2	9.3	9.4	9.2	9.1	8.4	8.6
Nuclear and Other Energy	1.9	3.1	3.3	4.0	4.5	5.3	5.1	4.7	3.7	3.3	3.3
Nonenergy	24.3	27.3	31.9	38.7	45.9	60.3	62.2	60.3	58.9	55.4	58.5
Nontraceables	1.9	2.1	2.4	3.4	5.2	6.9	7.4	7.4	7.5	7.4	7.3
Total	135.2	148.1	169.9	202.6	240.8	282.5	296.3	309.4	315.4	309.9	316.4
Domestic Petroleum and Natural Gas											
Production	36.4	40.5	51.8	65.8	83.2	100.7	108.4	123.1	126.8	118.9	114.7
Refining/Marketing	21.1	22.0	23.5	25.7	29.2	32.1	33.8	34.3	34.9	36.4	36.6
Rate Regulated Pipelines	11.2	11.2	11.0	11.1	11.2	10.8	12.1	12.0	15.4	19.8	20.2
Total	68.7	73.7	86.3	102.5	123.6	143.6	154.4	169.4	177.1	175.1	171.6
Foreign Petroleum and Natural Gas											
Production	16.4	19.0	21.9	27.4	31.5	35.2	37.1	39.6	40.0	40.1	44.0
Refining/Marketing	13.5	14.1	14.8	16.2	17.9	17.8	17.2	15.9	16.8	18.1	21.2
International Marine	5.6	5.4	5.3	5.3	4.9	4.2	3.6	2.8	2.3	2.0	1.9
Total	35.5	38.5	42.0	48.9	54.3	57.2	57.9	58.4	59.0	60.3	67.1

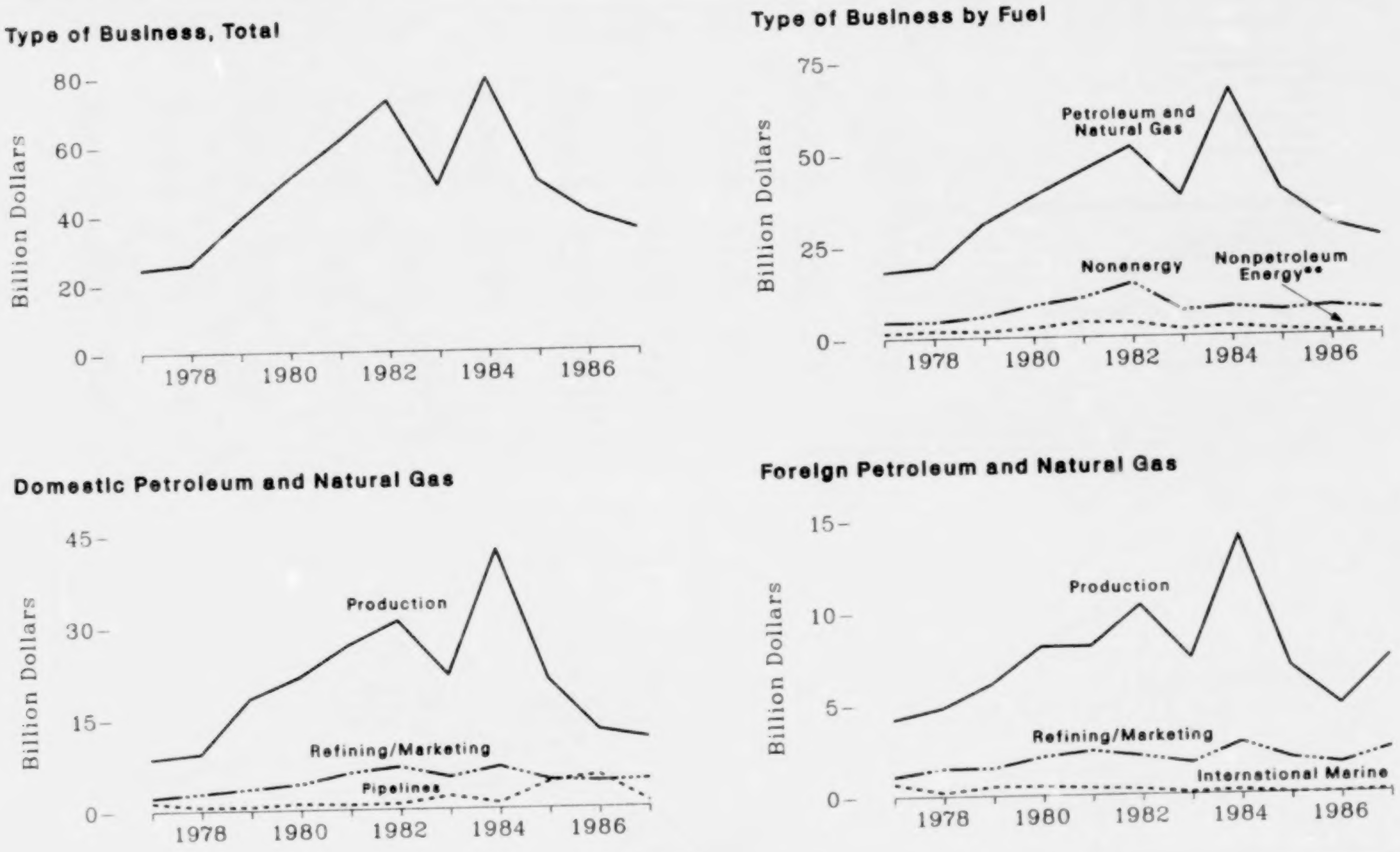
[1] Net property, plant, and equipment plus investments and advances.

[2] FRS = Financial Reporting System (see Appendix E, Note 3).

Note: Sum of components may not equal total due to independent rounding.

Source: Energy Information Administration, *Performance Profiles of Major Energy Producers*, various issues.

Figure 37. Additions to Investment in Place by FRS* Companies, 1977–1987



Type of Business, Total

Type of Business by Fuel

Domestic Petroleum and Natural Gas

Foreign Petroleum and Natural Gas

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*FRS = Financial Reporting System (see Appendix E, Note 3).
**Coal, nuclear and other energy.
Source: See Table 37.

Table 37. Additions to Investment in Place [1] by FRS [2] Companies, 1977-1987

(Billion Dollars)

Item	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Type of Business											
Petroleum and Natural Gas	18.1	19.2	30.7	38.0	44.9	51.5	38.2	66.8	39.8	30.2	26.6
Coal	0.9	1.0	0.8	1.3	2.9	2.1	1.1	1.6	1.5	0.6	0.6
Nuclear and Other Energy	0.6	0.9	0.9	1.2	1.2	1.7	0.8	1.0	0.1	0.2	0.3
Nonenergy	4.5	4.4	5.7	8.6	10.7	14.6	6.9	7.9	6.8	7.8	6.7
Nontraceables	0.2	0.1	0.4	1.0	1.1	2.7	1.0	1.4	1.1	0.9	0.6
Total	24.3	25.6	38.5	50.1	60.8	72.6	48.0	78.7	49.2	39.7	34.8
Domestic Petroleum and Natural Gas											
Production	8.5	9.3	18.2	21.6	26.8	30.8	21.8	42.1	21.8	12.7	11.3
Refining/Marketing	2.2	2.8	3.5	4.2	6.1	6.9	5.3	6.8	4.5	4.5	4.5
Rate Regulated Pipelines	1.4	0.6	0.6	1.0	0.8	0.9	2.1	0.9	4.3	5.3	0.9
Nontraceables	(3)	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	12.1	12.7	22.5	26.9	33.8	38.6	29.2	49.7	30.6	22.5	16.7
Foreign Petroleum and Natural Gas											
Production	4.2	4.8	6.1	8.1	8.3	10.4	7.2	14.0	7.1	5.5	7.4
Refining/Marketing	1.1	1.5	1.5	2.1	2.4	2.2	1.8	2.8	2.1	2.1	2.4
International Marine	0.7	0.2	0.5	0.5	0.4	0.3	0.1	0.2	(3)	(3)	0.1
Nontraceables	(3)	(3)	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	6.0	6.5	8.2	11.1	11.1	12.8	9.1	17.1	9.3	7.7	9.9

[1] Property, plant, and equipment plus investments and advances.
[2] FRS = Financial Reporting System (see Appendix E, Note 3).
[3] Less than $50 million.
Note: Sum of components may not equal total due to independent rounding.
Source: Energy Information Administration, *Performance Profiles of Major Energy Producers*, various issues.

4. Energy Resources

Crude Oil and Natural Gas Proved Reserves

Proved reserves of crude oil, natural gas, and natural gas liquids combined increased every year from 1949 until 1968 (44),[1] when, for the first time, production exceeded net additions to proved reserves. Except for the addition of Alaska's North Slope reserves in 1970, proved reserves fell each year through the 1970's before stabilizing at between 69 billion and 70 billion barrels (crude oil equivalent) in the first half of the 1980's. By 1987, proved reserves of crude oil had fallen from a 1970 peak of 39 billion barrels to 27 billion barrels. Proved reserves of natural gas had fallen from a 1967 peak of 293 trillion cubic feet to 187 trillion cubic feet in 1987, and proved reserves of natural gas liquids had declined from 9 billion barrels in 1967 to 8 billion barrels.

Crude Oil and Natural Gas Resources

The most recent U.S. Geological Survey assessment of U.S. undiscovered, recoverable resources provides mean estimates for 1980 of 83 billion barrels of crude oil and 594 trillion cubic feet of natural gas (38). On a Btu basis, about 46 percent of all onshore resources are located in the Colorado Plateau and Basin and Range and the Gulf Coast. Close to one-third of all resources are estimated to be offshore, primarily near Alaska and in the Gulf of Mexico. In 1984, resources in the Federal offshore area were estimated to be 23 billion barrels of crude oil and 161 trillion cubic feet of natural gas.

Coal Reserves: An Abundant Supply

The Energy Information Administration has estimated that the demonstrated reserve base of coal contained 475 billion short tons at the beginning of 1988 (45). Although recoverability rates differ from site to site, the rate for the reserve base as a whole is estimated to be at least 50 percent, enough to sustain coal production at current levels for more than 200 years.

Uranium Resources

At the end of 1987, reasonably assured uranium resources with forward costs (those yet to be incurred in production) of up to $30 per pound totaled 304 million pounds of U_3O_8, over half of which was in New Mexico (47). Estimated additional resources and speculative resources in the $30-per-pound category in 1987 totaled 1.3 billion pounds and 1.0 billion pounds, respectively.

Exploring for Energy Resources

Exploration for oil and gas is closely tied to market conditions, particularly to the price of crude oil. When the price rose in 1974, the number of seismic crews and rotary rigs also rose (39) and exploratory well completions increased (40). A second price hike sent all three indicators to record levels in 1981: seismic crews working were 681, rotary rigs in operation were 3,970, and completions of exploratory wells totaled 17.5 thousand. Subsequently, prices declined and then collapsed, leading to drastic cutbacks in exploration. In 1987, seismic crews working sank to 176, rotary rigs in operation to 936, and completions of exploratory wells to 6.5 thousand. In 1988, seismic crews working rose a modest 3 percent to 182, the number of rotary rigs in operation was unchanged at 936, and the number of exploratory wells completed fell 9 percent to 5.9 thousand.

Exploration for uranium also reflects changes in energy markets. The number of exploratory and development holes drilled peaked in 1978 at 104 thousand (46). As uranium market conditions deteriorated after 1978, the number plunged to less than 4 thousand in 1985 through 1987—the lowest level in at least three decades.

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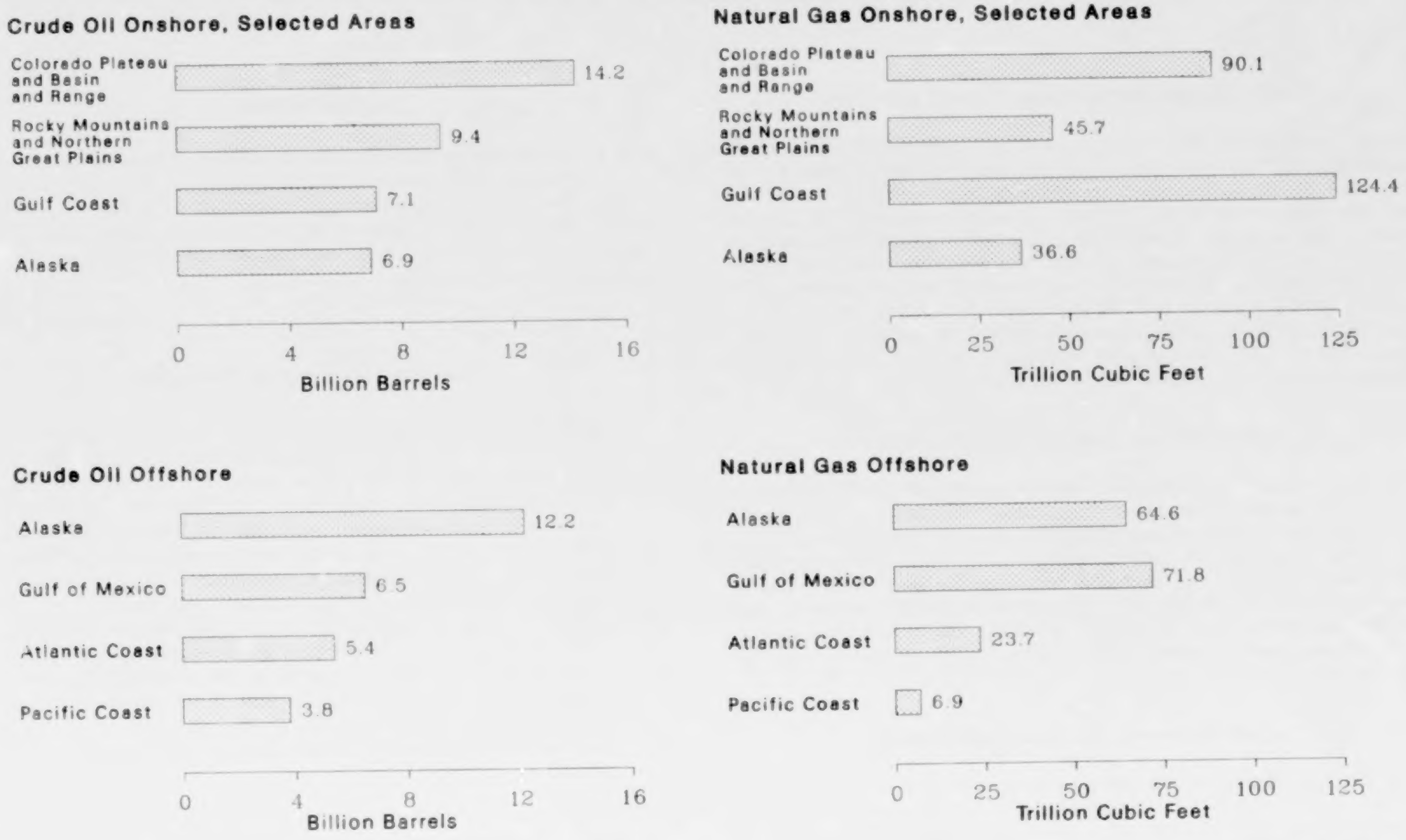
[1] Numbers in parentheses indicate related tables. Annual data are the most recent available and frequently are preliminary.

Figure 38. Estimated Undiscovered Recoverable Crude Oil and Natural Gas Resources in the United States, 1980



Crude Oil Onshore, Selected Areas

Natural Gas Onshore, Selected Areas

Crude Oil Offshore

Natural Gas Offshore

Note: Values plotted are the calculated means.
Source: See Table 38.

Table 38. Estimated Undiscovered Recoverable Crude Oil and Natural Gas Resources in the United States, 1980, and in the Federal Offshore, 1984

Region	Crude Oil (billion barrels)			Natural Gas (trillion cubic feet)		
		Estimated Range [1]			Estimated Range [1]	
	Mean [2]	Low	High	Mean [2]	Low	High
	United States, 1980					
Onshore						
Alaska	6.9	2.5	14.6	36.6	19.8	62.3
Pacific Coast	4.4	2.1	7.9	14.7	8.2	24.9
Colorado Plateau and Basin and Range	14.2	6.9	25.9	90.1	53.5	142.4
Rocky Mountains and Northern Great Plains	9.4	6.0	14.0	45.7	29.6	69.0
West Texas and Eastern New Mexico	5.4	2.7	9.4	42.8	22.4	75.2
Gulf Coast	7.1	3.6	12.6	124.4	56.5	249.1
Mid-Continent	4.4	2.3	7.7	44.5	22.9	80.8
Michigan Basin	1.1	0.3	2.7	5.1	1.8	10.9
Eastern Interior	0.9	0.3	1.9	2.7	1.2	5.0
Appalachians	0.6	0.1	1.5	20.1	6.4	45.8
Atlantic Coast	0.3	0.1	0.8	0.1	(3)	0.4
Total Onshore	54.6	41.7	71.0	426.8	322.5	567.9
Offshore						
Alaska [4]	12.2	4.6	24.2	64.6	33.3	109.6
Pacific Coast	3.8	1.7	7.9	6.9	3.7	13.6
Gulf of Mexico	6.5	3.1	11.1	71.8	41.7	114.2
Atlantic Coast	5.4	1.1	12.9	23.7	9.2	42.8
Total Offshore	28.0	16.9	43.5	167.0	117.4	230.6
Total United States	82.6	64.3	105.1	593.8	474.6	739.3
	Federal Offshore, 1984					
Federal Offshore [5]		Mean [2,6]	RMO [7]	Mean [2,6]	RMG [7]	
Alaska		12.6	3.3	62.7	13.9	
Pacific Coast		2.7	2.2	8.3	4.7	
Gulf of Mexico		6.0	6.0	59.6	59.6	
Atlantic Coast		1.6	0.7	30.4	12.3	
Total Federal Offshore		22.9	12.2	161.1	90.5	

[1] The low value of the range is the quantity associated with a 95 percent probability (19 in 20 chance) that there is at least this amount. The high value is the quantity with a 5 percent probability (1 in 20 chance) that there is at least this amount. Totals for the low and high values are not obtained by arithmetic summation; they are derived by statistical methods.

[2] The calculated mean from the probability curve using the Monte Carlo technique.

[3] Less than 0.1 trillion cubic feet.

[4] Includes quantities considered recoverable only if technology permits their exploitation beneath Arctic ice — a condition not yet met.

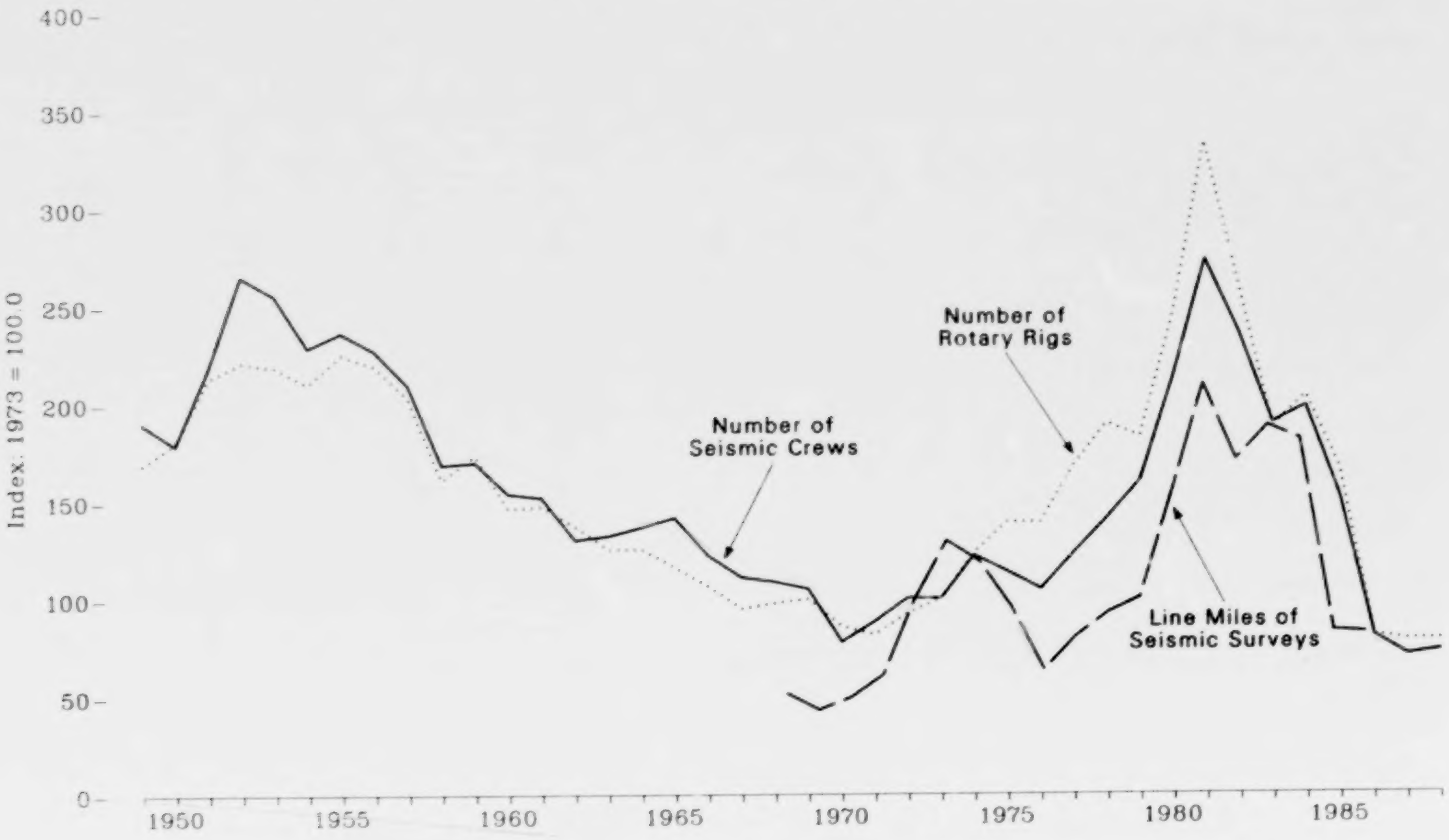
[5] Includes only the area encompassed by the Federally Controlled Outer Continental Shelf.

[6] Includes only economically recoverable quantities and assumes at least one commercial accumulation exists in the area (i.e., these are unrisked economically recoverable volumes).

[7] RMO = risked mean oil. RMG = risked mean gas. The Minerals Management Service methodology computes the marginal probability that economically recoverable hydrocarbons exist in the area. When applied to the mean volume, the methodology adjusts the figure to reflect the probability that the area may be nonproductive.

Sources: **United States, 1980:** U.S. Geological Survey, *Geological Estimates of Undiscovered Recoverable Conventional Resources of Oil and Gas in the United States, A Summary*, Circular 860, 1981. **Federal Offshore, 1984:** Department of the Interior, Minerals Management Service, *Estimates of Undiscovered, Economically Recoverable Oil and Gas Resources for the Outer Continental Shelf (OCS) as of July 1984*, OCS Report MMS 85-0012, 1985.

Figure 39. Seismic Crews, Line Miles, and Rotary Rigs, 1949–1988



Source: See Table 39.

Table 39. Seismic Crews, Line Miles, and Rotary Rigs, 1949-1988

Year	Crews Engaged in Seismic Exploration				Line Miles of Seismic Surveys (thousand)				Rotary Rigs in Operation [1]	
	Offshore	Onshore	Total	Index [2]	Offshore	Onshore	Total	Index [2]	Total	Index [2]
1949	NA	NA	476	190.4	NA	NA	NA	NA	2,017	168.9
1950	NA	NA	448	179.2	NA	NA	NA	NA	2,154	180.4
1951	NA	NA	545	218.0	NA	NA	NA	NA	2,543	213.0
1952	NA	NA	663	265.2	NA	NA	NA	NA	2,641	221.2
1953	NA	NA	639	255.6	NA	NA	NA	NA	2,613	218.8
1954	NA	NA	572	228.8	NA	NA	NA	NA	2,508	210.1
1955	NA	NA	591	236.4	NA	NA	NA	NA	2,686	225.0
1956	NA	NA	568	227.2	NA	NA	NA	NA	2,620	219.4
1957	NA	NA	524	209.6	NA	NA	NA	NA	2,426	203.2
1958	NA	NA	422	168.8	NA	NA	NA	NA	1,922	161.9
1959	NA	NA	425	170.0	NA	NA	NA	NA	2,071	173.5
1960	NA	NA	385	154.0	NA	NA	NA	NA	1,748	146.4
1961	NA	NA	380	152.0	NA	NA	NA	NA	1,761	147.5
1962	NA	NA	326	130.4	NA	NA	NA	NA	1,641	137.4
1963	NA	NA	331	132.4	NA	NA	NA	NA	1,499	125.5
1964	NA	NA	342	136.8	NA	NA	NA	NA	1,501	125.7
1965	36	318	354	141.6	NA	NA	NA	NA	1,388	116.2
1966	38	268	306	122.4	NA	NA	NA	NA	1,272	106.5
1967	29	249	278	111.2	NA	NA	NA	NA	1,135	95.1
1968	20	252	272	108.8	NA	NA	NA	NA	1,169	97.9
1969	16	247	263	105.2	NA	NA	199.9	51.8	1,194	100.0
1970	10	185	195	78.0	NA	NA	167.3	43.3	1,028	86.1
1971	10	211	221	88.4	NA	NA	191.7	49.7	976	81.7
1972	12	239	251	100.4	NA	NA	235.7	61.0	1,107	92.7
1973	23	227	250	100.0	258.9	127.2	386.1	100.0	1,194	100.0
1974	31	274	305	122.0	341.8	158.6	500.4	129.6	1,472	123.3
1975	30	254	284	113.6	309.3	150.7	460.0	119.1	1,660	139.0
1976	25	237	262	104.8	226.3	142.9	369.2	95.6	1,658	138.9
1977	27	281	308	123.2	124.7	120.1	244.7	63.4	2,001	167.6
1978	25	327	352	140.8	174.6	135.9	310.5	80.4	2,259	189.2
1979	30	370	400	160.0	193.2	163.9	357.1	92.5	2,177	182.3
1980	37	493	530	212.0	202.7	184.1	386.8	100.2	2,909	243.6
1981	44	637	681	272.4	338.2	256.2	594.4	153.9	3,970	332.5
1982	57	531	588	235.2	558.5	248.5	806.9	209.0	3,105	260.1
1983	47	426	473	189.2	469.2	188.5	657.7	170.3	2,232	186.9
1984	49	445	494	197.6	538.5	185.9	724.4	187.6	2,428	203.4
1985	45	333	378	151.2	557.7	140.0	697.7	180.7	1,980	165.8
1986	24	176	201	80.4	252.6	67.6	320.2	82.9	964	80.7
1987	24	153	176	70.4	263.7	52.7	316.5	82.0	936	78.4
1988	29	153	182	72.8	NA	NA	NA	NA	936	78.4

[1] Data are not for the exact calendar year but for the 52 or 53 consecutive whole weeks that most nearly coincide with the calendar year.

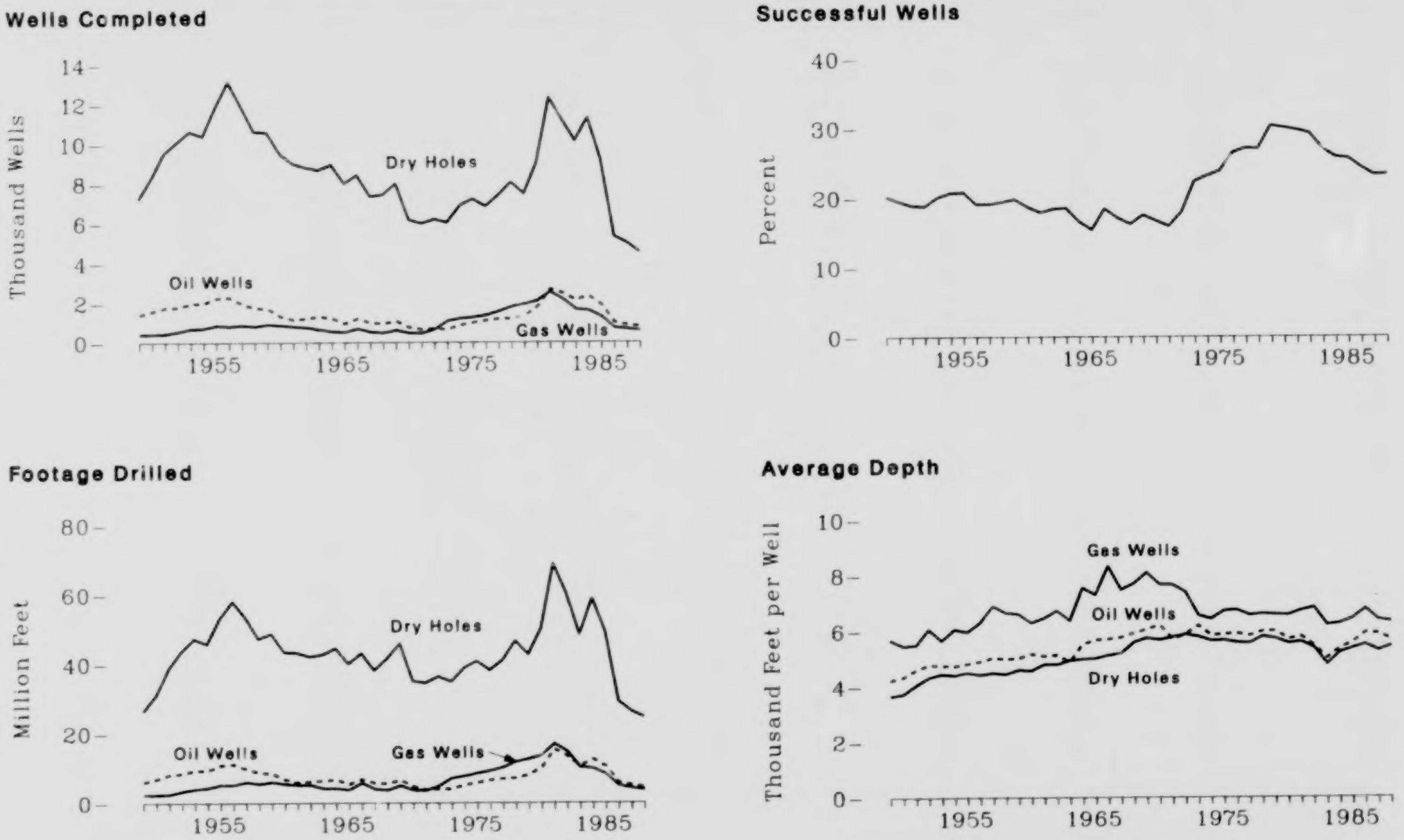
[2] Index: 1973 = 100.0.

NA = Not available.

Note: Sum of components may not equal total due to independent rounding.

Sources: •**Crews Engaged in Seismic Exploration** and **Line Miles of Seismic Surveys:** Society of Exploration Geophysicists, *SEG News Release*, and *Geophysics: The Leading Edge of Exploration*, Monthly, Tulsa, Oklahoma. •**Rotary Rigs in Operation:** *Rotary Rigs Running-By States*, Hughes Tool Company, Houston, Texas.

Figure 40. Exploratory Oil and Gas Wells Completed and Footage Drilled, 1949–1988



Source: See Table 40.

Table 40. Exploratory Oil and Gas Wells Completed and Footage Drilled, 1949-1988

Year	Wells Completed (thousands)				Footage Drilled (million feet)				Average Depth (feet per well)				Successful Wells (percent)
	Oil	Gas	Dry Holes	Total	Oil	Gas	Dry Holes	Total	Oil	Gas	Dry Holes	Total	
1949	1.41	0.42	7.23	9.06	6.0	2.4	26.4	34.8	4,232	5,682	3,658	3,842	20.2
1950	1.58	0.43	8.29	10.31	6.9	2.4	31.0	40.2	4,335	5,466	3,733	3,898	19.5
1951	1.76	0.45	9.54	11.76	8.1	2.5	38.7	49.3	4,609	5,497	4,059	4,197	18.9
1952	1.78	0.56	10.09	12.43	8.5	3.4	43.7	55.6	4,781	6,071	4,334	4,476	18.8
1953	1.98	0.70	10.63	13.31	9.4	4.0	47.3	60.7	4,761	5,654	4,447	4,557	20.1
1954	1.99	0.73	10.39	13.10	9.4	4.4	45.8	59.6	4,740	6,059	4,408	4,550	20.7
1955	2.24	0.87	11.83	14.94	10.8	5.2	53.2	69.2	4,819	5,964	4,498	4,632	20.8
1956	2.27	0.82	13.12	16.21	11.1	5.2	58.0	74.3	4,901	6,301	4,425	4,587	19.1
1957	1.95	0.87	11.90	14.71	9.8	6.0	53.4	69.2	5,036	6,898	4,488	4,702	19.1
1958	1.75	0.82	10.63	13.20	8.7	5.5	47.3	61.5	4,993	6,657	4,449	4,658	19.4
1959	1.70	0.91	10.58	13.19	8.5	6.0	48.7	63.3	5,021	6,613	4,602	4,795	19.8
1960	1.32	0.87	9.52	11.70	6.8	5.5	43.5	55.8	5,170	6,298	4,575	4,770	18.7
1961	1.16	0.81	9.02	10.99	5.9	5.2	43.3	54.4	5,099	6,457	4,799	4,953	17.9
1962	1.21	0.77	8.82	10.80	6.2	5.2	42.2	53.6	5,124	6,728	4,790	4,966	18.4
1963	1.31	0.66	8.69	10.66	6.4	4.2	42.8	53.5	4,878	6,370	4,933	5,016	18.5
1964	1.22	0.56	8.95	10.73	6.7	4.2	44.6	55.5	5,509	7,547	4,980	5,174	16.6
1965	0.95	0.52	8.01	9.47	5.4	3.8	40.1	49.2	5,672	7,295	5,007	5,198	15.4
1966	1.20	0.70	8.42	10.31	6.8	5.8	43.1	55.7	5,700	8,321	5,117	5,402	18.4
1967	0.99	0.53	7.36	8.88	5.7	4.0	38.2	47.8	5,758	7,478	5,188	5,388	17.1
1968	0.95	0.49	7.44	8.88	5.6	3.7	41.6	51.0	5,914	7,697	5,589	5,739	16.2
1969	1.08	0.62	8.00	9.70	6.6	5.0	45.9	57.5	6,054	8,092	5,739	5,924	17.5
1970	0.76	0.48	6.19	7.43	4.7	3.7	35.1	43.5	6,198	7,669	5,671	5,854	16.7
1971	0.66	0.47	6.00	7.13	3.8	3.6	34.6	42.0	5,702	7,654	5,765	5,885	15.9
1972	0.69	0.66	6.20	7.55	4.0	4.9	36.4	45.3	5,858	7,393	5,863	5,996	17.9
1973	0.65	1.08	6.04	7.77	4.0	7.1	34.9	46.0	6,187	6,556	5,785	5,926	22.3
1974	0.87	1.21	6.89	8.97	5.1	7.7	38.9	51.7	5,826	6,425	5,637	5,761	23.1
1975	0.99	1.26	7.21	9.46	5.8	8.5	40.8	55.1	5,875	6,714	5,655	5,819	23.8
1976	1.10	1.36	6.85	9.32	6.5	9.2	38.2	53.9	5,903	6,748	5,575	5,785	26.4
1977	1.18	1.56	7.40	10.15	6.9	10.2	41.1	58.3	5,821	6,562	5,557	5,743	27.1
1978	1.19	1.79	8.05	11.04	7.1	11.8	46.6	65.6	5,974	6,604	5,787	5,940	27.0
1979	1.34	1.92	7.48	10.73	8.0	12.6	42.7	63.4	5,985	6,579	5,715	5,903	30.3
1980	1.78	2.09	9.04	12.91	10.1	13.7	50.1	73.9	5,684	6,558	5,540	5,725	30.0
1981	2.67	2.53	12.30	17.50	15.4	17.0	68.8	101.3	5,789	6,724	5,598	5,790	29.7
1982	2.46	2.16	11.20	15.82	13.4	14.7	60.2	88.3	5,451	6,829	5,372	5,583	29.2
1983	2.11	1.65	10.13	13.88	10.5	10.2	48.4	69.1	4,995	6,206	4,784	4,985	27.0
1984[1]	2.33	1.59	11.29	15.21	12.5	9.9	58.8	81.3	5,356	6,257	5,211	5,342	25.8
1985[1]	1.87	1.28	9.17	12.32	10.4	8.2	49.2	67.8	5,562	6,426	5,362	5,503	25.6
1986[1]	0.99	0.72	5.32	7.03	5.8	4.9	29.2	39.9	5,918	6,775	5,491	5,683	24.3
1987[1]	0.85	0.66	4.99	6.49	5.0	4.2	26.3	35.5	5,883	6,386	5,275	5,467	23.2
1988[1]	0.79	0.59	4.52	5.89	4.5	3.7	24.6	32.8	5,665	6,321	5,442	5,560	23.3

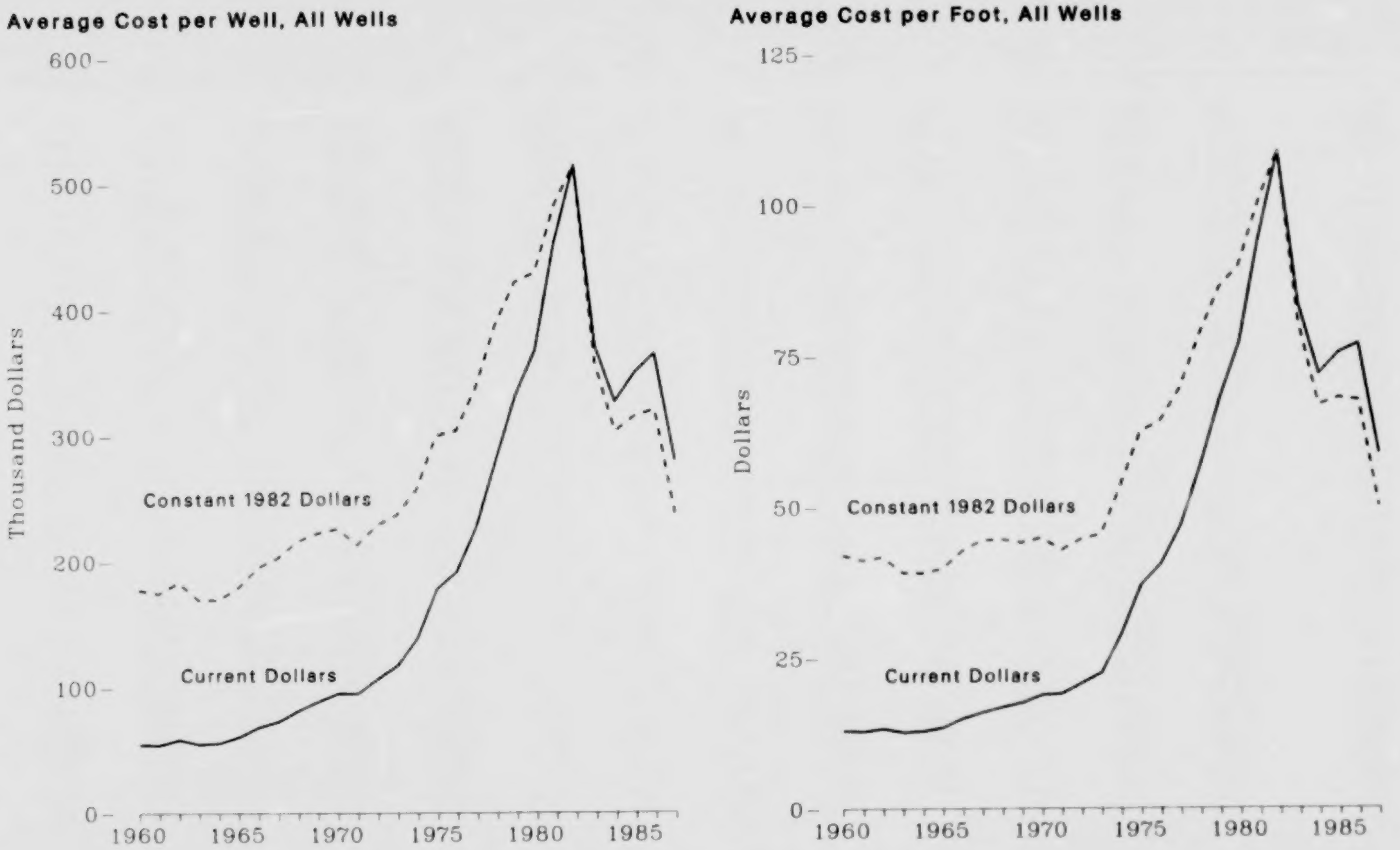
[1] Data for these years are preliminary. See Appendix E, Note 4.

Note: Sum of components may not equal total due to independent rounding. Average depth may not equal average of components due to independent rounding.

Note: For 1949 through 1959, data represent wells completed in a given year. For 1960 through 1969, data are for well completion reports received by the American Petroleum Institute during the reporting year. For 1970 forward, the data represent wells completed in a given year. See Appendix E, Note 4.

Sources: •1949 through 1960—American Association of Petroleum Geologists, *Statistics on Exploratory Drilling in the United States, 1940 through 1960*, Tulsa, Oklahoma, 1962, pp. 4-19. •1961 through 1965 —*Bulletin of the American Association of Petroleum Geologists*, "North American Developments" issue, Tulsa, Oklahoma. •1966 through 1969—American Petroleum Institute, *Quarterly Review of Drilling Statistics for the United States*, annual summaries and monthly reports. •1970 and forward—Energy Information Administration computations based on well reports submitted to the American Petroleum Institute.

Figure 42. Average Cost of Oil and Gas Wells Drilled, 1960–1987



Average Cost per Well, All Wells

Average Cost per Foot, All Wells

Source: See Table 42.

Table 42. Average Cost of Oil and Gas Wells Drilled, 1960-1987

Year	Average Cost per Well (thousand dollars)					Average Cost per Foot (dollars)				
	Oil	Gas	Dry Holes	All		Oil	Gas	Dry Holes	All	
	(current)	(current)	(current)	(current)	(constant) [1]	(current)	(current)	(current)	(current)	(constant) [1]
1960	52.2	102.7	44.0	54.9	177.8	13.22	18.57	10.56	13.01	42.10
1961	51.3	94.7	45.2	54.5	174.7	13.11	17.65	10.56	12.85	41.19
1962	54.2	97.1	50.8	58.6	183.8	13.41	18.10	11.20	13.31	41.72
1963	51.8	92.4	48.2	55.0	169.8	13.20	17.19	10.58	12.69	39.17
1964	50.6	104.8	48.5	55.8	169.7	13.12	18.57	10.64	12.86	39.09
1965	56.6	101.9	53.1	60.6	179.4	13.94	18.35	11.21	13.44	39.76
1966	62.2	133.8	56.9	68.4	195.4	15.04	21.75	12.34	14.95	42.71
1967	66.6	141.0	61.5	72.9	203.1	16.61	23.05	12.87	15.97	44.48
1968	79.1	148.5	66.2	81.5	216.1	18.63	24.05	12.88	16.83	44.64
1969	86.5	154.3	70.2	88.6	222.5	19.28	25.58	13.23	17.56	44.12
1970	86.7	160.7	80.9	94.9	225.9	19.29	26.75	15.21	18.84	44.86
1971	78.4	166.6	86.8	94.7	213.3	18.41	27.70	16.02	19.03	42.86
1972	93.5	157.8	94.9	106.4	228.9	20.77	27.78	17.28	20.76	44.65
1973	103.8	155.3	105.8	117.2	236.7	22.54	27.46	19.22	22.50	45.45
1974	110.2	189.2	141.7	138.7	256.9	27.82	34.11	26.76	28.93	53.57
1975	138.6	262.0	177.2	177.8	299.8	34.17	46.23	33.86	36.99	62.38
1976	151.1	270.4	190.3	191.6	303.7	37.35	49.78	36.94	40.46	64.12
1977	170.0	313.5	230.2	227.2	337.6	41.16	57.57	43.49	46.81	69.55
1978	208.0	374.2	281.7	280.0	387.7	49.72	68.37	52.55	56.63	78.43
1979	243.1	443.1	339.6	331.4	421.6	58.29	80.66	64.60	67.70	86.13
1980	272.1	536.4	376.5	367.7	429.0	66.36	95.16	73.70	77.02	89.87
1981	336.3	698.6	464.0	453.7	482.7	80.40	122.17	90.03	94.30	100.32
1982	347.4	864.3	515.4	514.4	514.4	86.34	146.20	104.09	108.73	108.73
1983	283.8	608.1	366.5	371.7	357.8	72.65	108.37	79.10	83.34	80.21
1984	262.1	489.8	329.2	326.5	303.1	66.32	88.80	67.18	71.90	66.76
1985	270.4	508.7	372.3	349.4	315.1	66.78	93.09	73.69	75.35	67.94
1986	284.9	522.9	389.2	364.6	320.1	68.35	93.02	76.53	76.88	67.50
1987	246.0	380.4	259.1	279.6	237.6	58.35	69.55	51.05	58.71	49.88

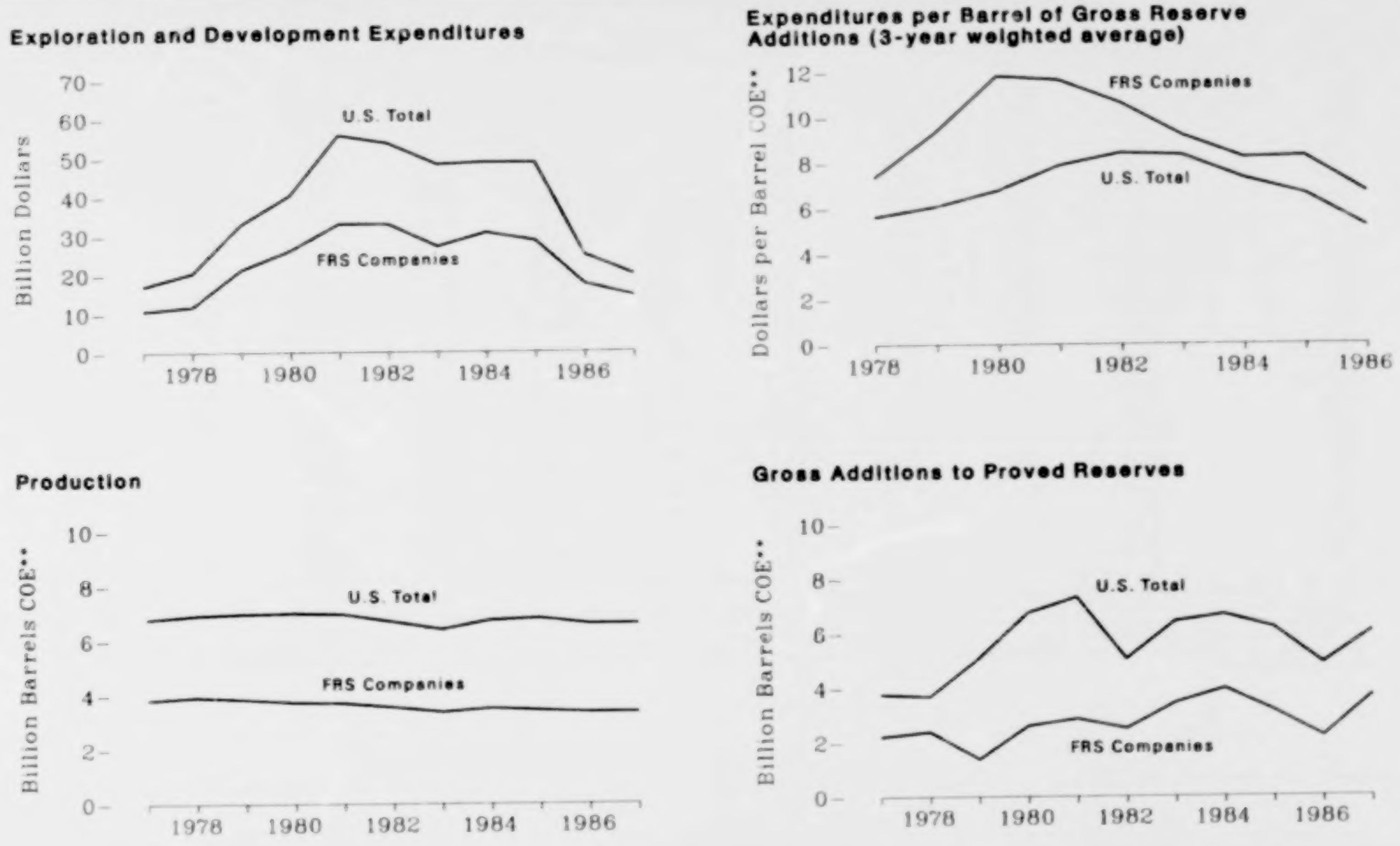
[1] In 1982 dollars, calculated using implicit GNP price deflators. See Appendix C.

Note: Average cost is the arithmetic mean and includes all costs for drilling and equipping wells and for surface producing facilities. Wells drilled include exploratory and development wells; excludes service wells, stratigraphic tests, and core tests.

Note: The information reported for 1965 and prior years is not strictly comparable with the more recent surveys.

Source: American Petroleum Institute, Independent Petroleum Association of America, Mid-Continent Oil and Gas Association, Washington, DC, *Joint Association Survey of the U.S. Oil and Gas Producing Industry.*

Figure 43. FRS* and U.S. Exploration and Development Expenditures, Additions to Reserves, and Production of Oil and Gas, 1977–1987



Exploration and Development Expenditures

Expenditures per Barrel of Gross Reserve Additions (3-year weighted average)

Production

Gross Additions to Proved Reserves

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*FRS = Financial Reporting System (see Appendix E, Note 3).
**COE = Crude Oil Equivalent.
Source: See Table 43.

Table 43. Exploration and Development Expenditures, Gross Additions to Proved Reserves, and Production of Liquid and Gaseous Hydrocarbons by FRS[1] Companies and U.S. Industry, 1977-1987

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Exploration and Development Expenditures											
(billion dollars)											
FRS Companies[2]	10.7	11.8	21.3	26.2	33.0	32.9	27.1	30.6	28.5	17.4	14.3
U.S. Total	17.0	20.4	32.9	40.4	55.7	53.7	48.2	48.7	43.6	24.9	19.8
Gross Additions to Proved Reserves[3] of Liquid and Gaseous Hydrocarbons[4]											
(million barrels COE[5])											
FRS Companies[6]	2,210.3	2,383.0	1,377.7	2,590.2	2,848.5	2,482.0	3,426.6	3,940.8	3,128.6	2,186.8	3,698.2
U.S. Total	3,765.3	3,678.9	5,071.3	6,723.1	7,303.6	5,029.6	6,412.2	6,653.1	6,189.7	4,866.2	6,058.5
Expenditures per Barrel of Reserve Additions, Three-Year Weighted Average											
(dollars per barrel COE[5])											
FRS Companies[2], [6]	NA	7.34	9.34	11.80	11.63	10.62	9.20	8.21	8.27	6.67	NA
U.S. Total	NA	5.62	6.06	6.76	7.86	8.41	8.32	7.30	6.61	5.16	NA
Production of Liquid and Gaseous Hydrocarbons[4]											
(million barrels COE[5])											
FRS Companies[6]	3,809.4	3,916.0	3,834.0	3,726.8	3,693.9	3,551.1	3,370.3	3,503.2	3,427.1	3,361.1	3,353.6
U.S. Total	6,776.6	6,918.0	6,969.9	6,995.3	6,954.4	6,681.9	6,398.6	6,736.4	6,798.1	6,601.9	6,596.3

[1] FRS = Financial Reporting System (see Appendix E, Note 3).

[2] FRS data for 1982 and 1984 are adjusted to exclude purchases of proved reserves associated with mergers among the FRS Companies.

[3] Gross additions to proved reserves equal annual change in proved reserves plus annual production.

[4] Liquid and gaseous hydrocarbons include crude oil, natural gas liquids, and natural gas.

[5] Crude oil equivalent: converted to Btu based on annual average conversion factors. See Appendix A.

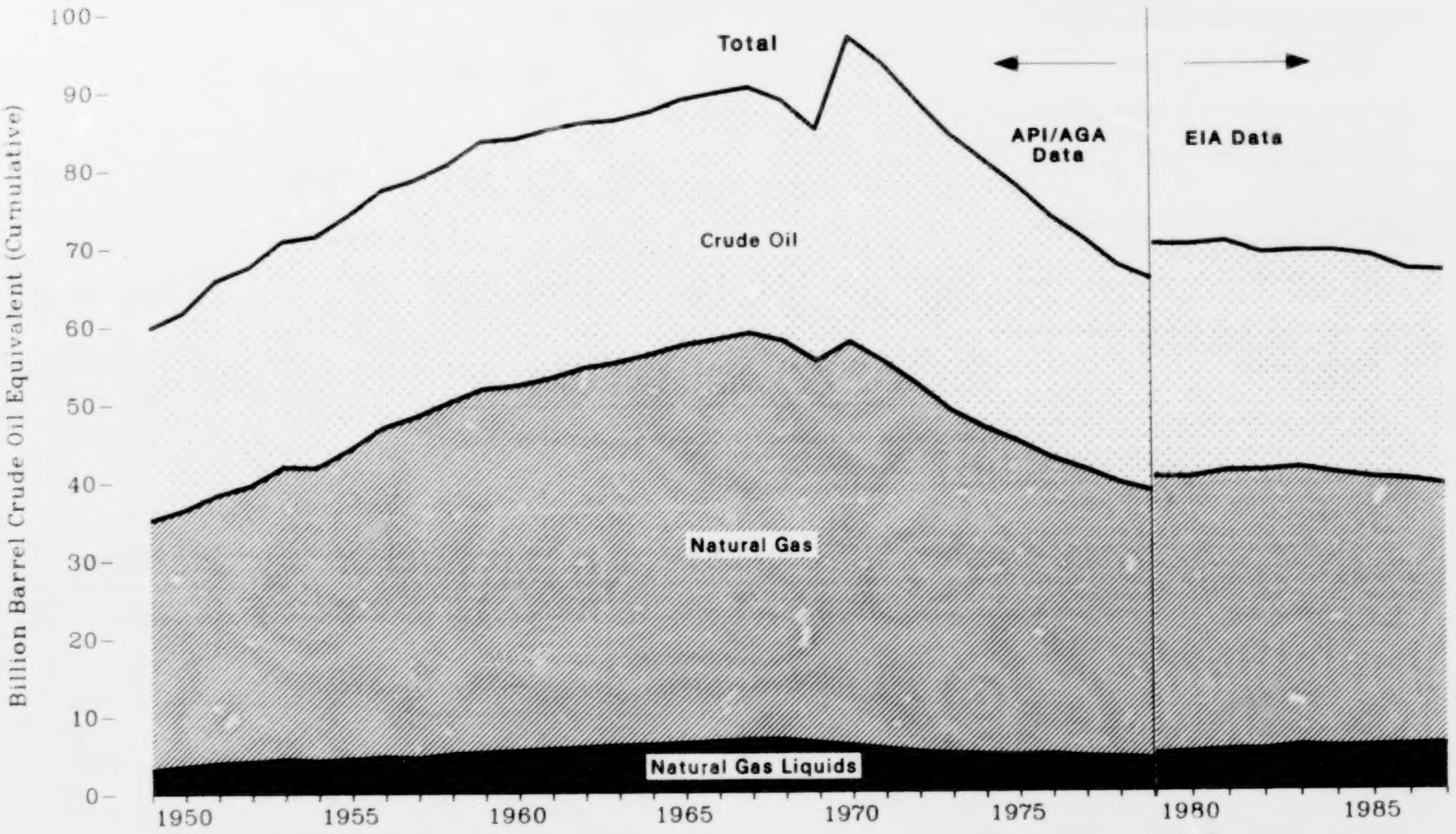
[6] Based on net ownership interest (see Glossary).

NA = Not available.

Note: Data in this table are for U.S. domestic operations only (see Appendix E, Note 3).

Sources: **FRS Companies:** Energy Information Administration, *Form EIA-28*, "Financial Reporting System." **U.S. Total, Exploration and Development Expenditures:** •1977 through 1982—Bureau of the Census, *Annual Survey of Oil and Gas*. •1983 through 1987—American Petroleum Institute, *Survey on Oil and Gas Expenditures 1987*, November 1988. **U.S. Total, Gross Additions to Proved Reserves of Liquid and Gaseous Hydrocarbons:** •1977 through 1979—American Gas Association, American Petroleum Institute, and Canadian Petroleum Association (published jointly), *Reserves of Crude Oil, Natural Gas Liquids, and Natural Gas in the United States and Canada as of December 31, 1979*, Volume 34, June 1980. • 1980 and forward—Energy Information Administration, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves, 1987 Annual Report* (October 1988). **U.S. Total, Production of Liquid and Gaseous Hydrocarbons:** Tables 48 and 68.

Figure 44. Proved Reserves of Liquid and Gaseous Hydrocarbons, End of Year 1949–1987



Source: See Table 44.

Table 44. Proved Reserves of Liquid and Gaseous Hydrocarbons, End of Year 1949-1987

Year	Crude Oil	Natural Gas		Natural Gas Liquids		Total
	Billion Barrels	Trillion Cubic Feet [1]	Billion Barrels COE [2]	Billion Barrels	Billion Barrels COE [2]	Billion Barrels COE
	American Petroleum Institute and American Gas Association Data					
1949	24.6	179.4	32.0	3.7	3.1	59.7
1950	25.3	184.6	32.9	4.3	3.5	61.7
1951	27.5	192.8	34.4	4.7	3.9	65.7
1952	28.0	198.6	35.4	5.0	4.1	67.5
1953	28.9	210.3	37.5	5.4	4.4	70.9
1954	29.6	210.6	37.6	5.2	4.2	71.3
1955	30.0	222.5	39.7	5.4	4.4	74.1
1956	30.4	236.5	42.2	5.9	4.7	77.3
1957	30.3	245.2	43.8	5.7	4.5	78.6
1958	30.5	252.8	45.1	6.2	5.0	80.6
1959	31.7	261.2	46.6	6.5	5.2	83.5
1960	31.6	262.3	46.8	6.8	5.4	83.8
1961	31.8	266.3	47.5	7.0	5.6	84.8
1962	31.4	272.3	48.6	7.3	5.8	85.7
1963	31.0	276.2	49.1	7.7	6.0	86.1
1964	31.0	281.3	50.0	7.7	6.1	87.1
1965	31.4	286.5	51.0	8.0	6.3	88.6
1966	31.5	289.3	51.5	8.3	6.5	89.5
1967	31.4	292.9	52.1	8.6	6.7	90.2
1968	30.7	287.3	51.1	8.6	6.7	88.5
1969	29.6	275.1	48.9	8.1	6.3	84.8
1970	39.0	290.7	51.7	7.7	5.9	96.6
1971	38.1	278.8	49.6	7.3	5.5	93.2
1972	36.3	266.1	47.1	6.8	5.1	88.5
1973	35.3	250.0	44.0	6.5	4.8	84.1
1974	34.2	237.1	41.9	6.4	4.7	80.8
1975	32.7	228.2	40.2	6.3	4.6	77.5
1976	30.9	216.0	38.0	6.4	4.7	73.6
1977	29.5	208.9	36.8	6.0	4.4	70.6
1978	27.8	200.3	35.2	5.9	4.3	67.3
1979	27.1	194.9	34.3	5.7	4.1	65.5
	Energy Information Administration Data					
1977	31.8	207.4	36.5	NA	NA	NA
1978	31.4	208.0	36.5	6.8	4.9	72.8
1979	29.8	201.0	35.4	6.6	4.8	70.0
1980	29.8	199.0	35.2	6.7	4.9	69.9
1981	29.4	201.7	35.7	7.1	5.2	70.3
1982	27.9	201.5	35.7	7.2	5.2	68.8
1983	27.7	200.2	35.6	7.9	5.7	69.0
1984	28.4	197.5	35.1	7.6	5.5	69.0
1985	28.4	193.4	34.4	7.9	5.6	68.5
1986	26.9	191.6	34.0	8.2	5.7	66.6
1987	27.3	187.2	33.3	8.1	5.8	66.3

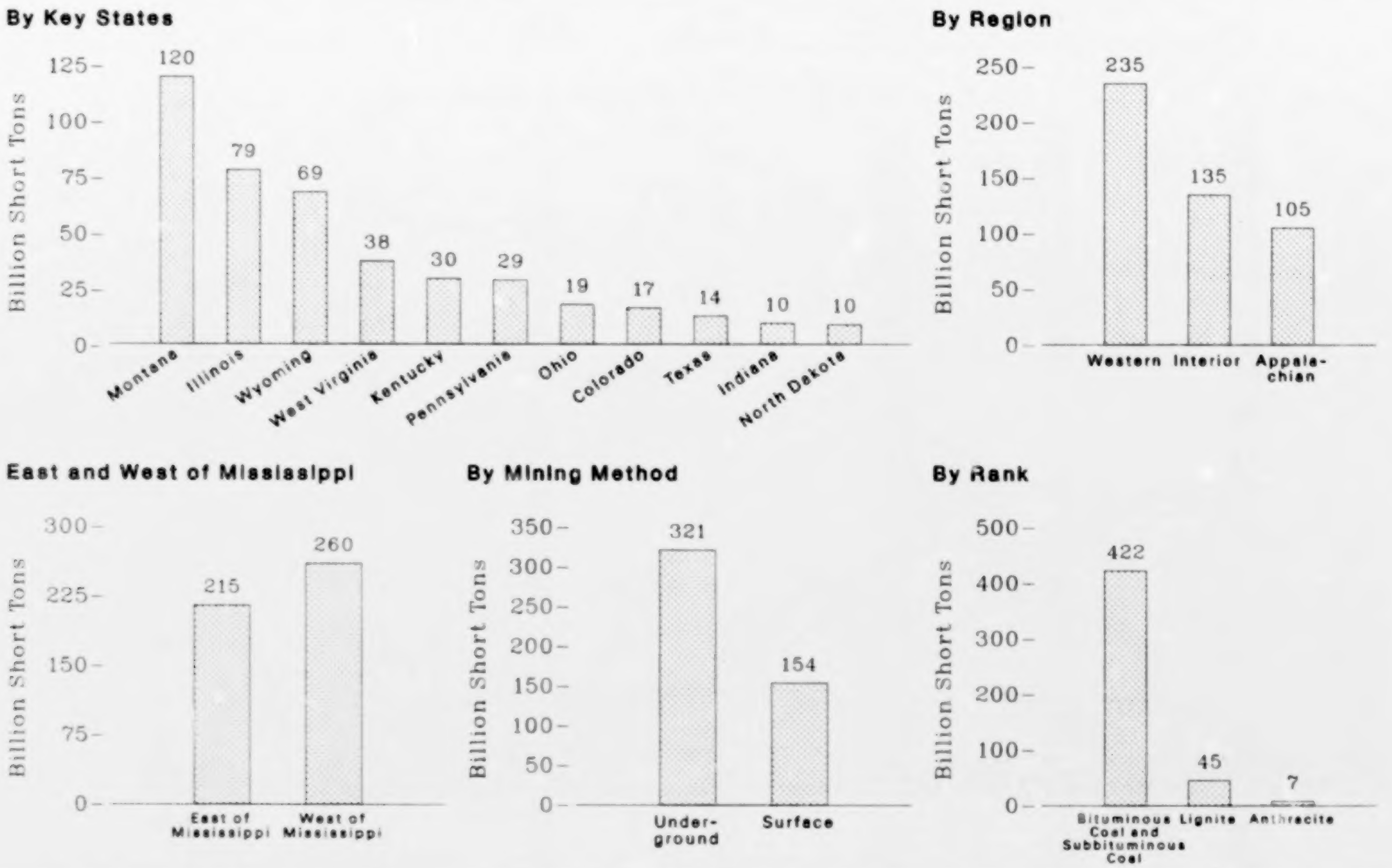
[1] The American Gas Association estimates of natural gas proved reserves include volumes of gas held in underground storage. In 1979, this volume amounted to 4.9 trillion cubic feet. Energy Information Administration data do not include gas in underground storage.

[2] Crude oil equivalent; converted to Btu based on annual average conversion factors. See Appendix A.

NA = Not available.

Sources: •**API/AGA Data**—American Gas Association, American Petroleum Institute, and Canadian Petroleum Association (published jointly). *Reserves of Crude Oil, Natural Gas Liquids and Natural Gas in the United States and Canada as of December 31, 1979,* Volume 34, June 1980. •**EIA Data**—Energy Information Administration, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves, 1987 Annual Report* (October 1988).

Figure 45. Demonstrated Reserve Base of Coal, January 1, 1988



By Key States

By Region

East and West of Mississippi

By Mining Method

By Rank

Source: See Table 45.

Table 45. Demonstrated Reserve Base of Coal,[1] January 1, 1988

(Billion Short Tons)

Region and State	Anthracite	Bituminous Coal[2]		Lignite	Total		
	Underground and Surface[3]	Underground	Surface	Surface[4]	Underground	Surface	Total
Appalachian							
Alabama	0	1.6	2.3	1.1	1.6	3.4	4.9
Kentucky, Eastern	0	7.8	1.8	0	7.8	1.8	9.6
Ohio	0	12.9	5.8	0	12.9	5.8	18.6
Pennsylvania	7.1	21.1	1.3	0	28.1	1.4	29.5
Virginia	0.1	2.0	0.8	0	2.1	0.8	2.9
West Virginia	0	33.0	4.9	0	33.0	4.9	37.9
Other[5]	0	1.2	0.4	0	1.2	0.4	1.7
Total	7.2	79.6	17.3	1.1	86.7	18.4	105.1
Interior							
Illinois	0	63.1	15.5	0	63.1	15.5	78.5
Indiana	0	8.9	1.4	0	8.9	1.4	10.3
Iowa	0	1.7	0.5	0	1.7	0.5	2.2
Kentucky, Western	0	16.7	3.9	0	16.7	3.9	20.6
Missouri	0	1.5	4.5	0	1.5	4.5	6.0
Oklahoma	0	1.2	0.4	0	1.2	0.4	1.6
Texas	0	0	0	13.5	0	13.5	13.5
Other[6]	0.1	0.3	1.1	0.5	0.4	1.6	2.0
Total	0.1	93.4	27.2	14.1	93.5	41.2	134.7
Western							
Alaska	0	5.4	0.7	(7)	5.4	0.7	6.1
Colorado	(7)	12.2	0.7	4.2	12.2	4.9	17.1
Montana	0	71.0	33.4	15.8	71.0	49.2	120.1
New Mexico	(7)	2.1	2.4	0	2.1	2.4	4.5
North Dakota	0	0	0	9.7	0	9.7	9.7
Utah	0	6.0	0.3	0	6.0	0.3	6.3
Washington	0	1.3	0.1	(7)	1.3	0.1	1.4
Wyoming	0	42.6	26.1	0	42.6	26.1	68.7
Other[8]	0	0.1	0.2	0.4	0.1	0.6	0.7
Total	(7)	140.7	63.9	30.1	140.7	93.9	234.5
U.S. Total	7.3	313.7	108.3	45.2	320.9	153.6	474.5
States East of the Mississippi River	7.2	168.4	37.9	1.1	175.5	39.2	214.6
States West of the Mississippi River	0.1	145.3	70.3	44.1	145.4	114.5	259.9

[1] Includes measured and indicated resource categories representing 100 percent of the coal in place. Recoverability varies from less than 40 percent to more than 90 percent for individual deposits. About one-half of the demonstrated reserve base of coal in the United States is estimated to be recoverable.

[2] Includes subbituminous coal.

[3] Includes 123.8 million short tons of surface mine reserves, of which 108.3 million tons are in Pennsylvania and 15.5 million tons are in Arkansas.

[4] There are no underground demonstrated coal reserves of lignite.

[5] Includes Georgia, Maryland, North Carolina, and Tennessee.

[6] Includes Arkansas, Kansas, Louisiana, and Michigan.

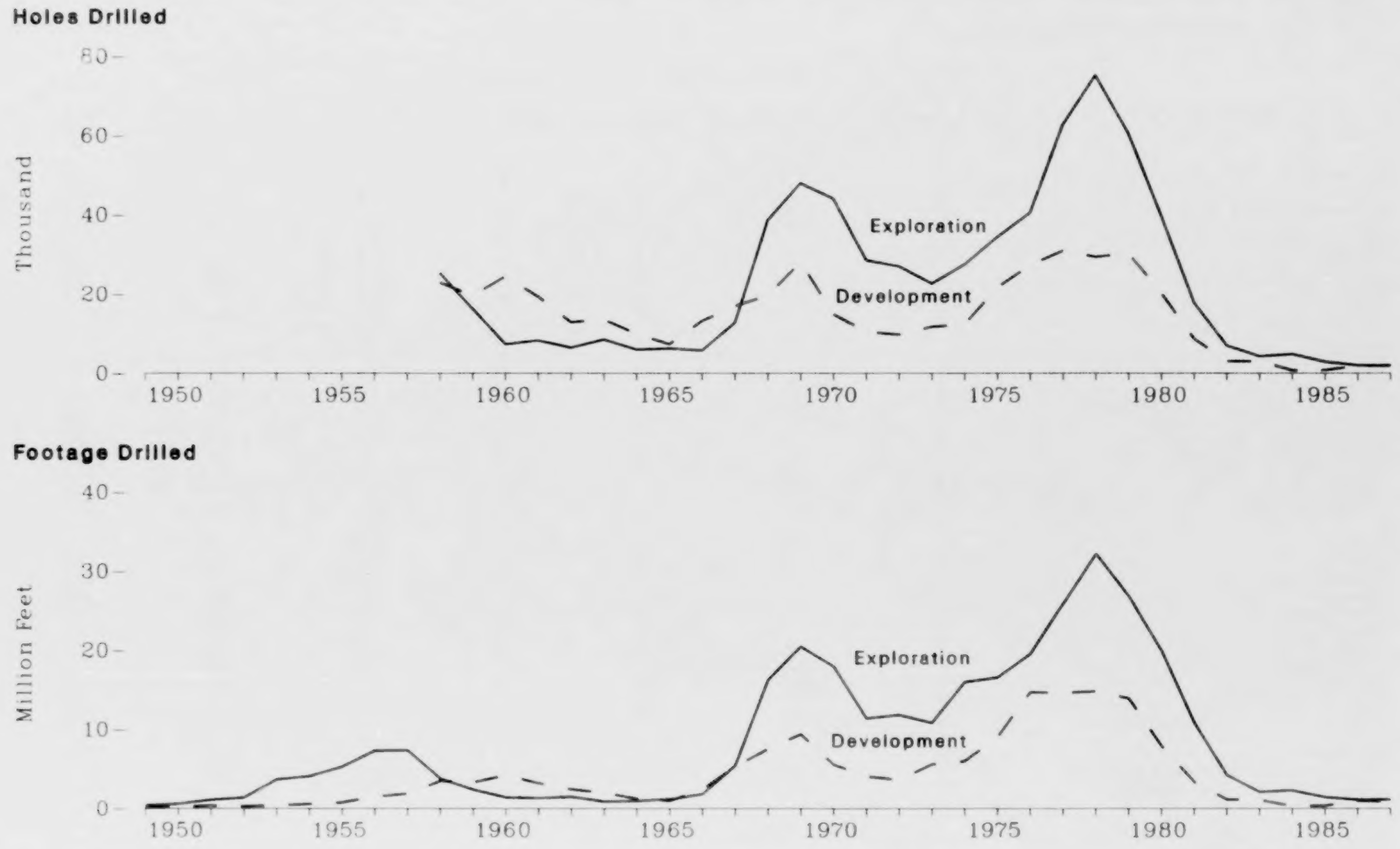
[7] Less than 0.05 billion short tons.

[8] Includes Arizona, Idaho, Oregon, and South Dakota.

Note: Sum of components may not equal total due to independent rounding.

Source: Energy Information Administration, *Coal Production 1987* (December 1988).

Figure 46. Uranium Exploration and Development Drilling, 1949–1987



Source: See Table 46.

Table 46. Uranium Exploration and Development Drilling, 1949-1987

Year	Exploration[1]		Development[2]		Total	
	Holes Drilled (thousands)	Footage Drilled (million feet)	Holes Drilled (thousands)	Footage Drilled (million feet)	Holes Drilled (thousands)	Footage Drilled (million feet)
1949	NA	0.36	NA	0.05	NA	0.41
1950	NA	0.57	NA	0.21	NA	0.78
1951	NA	1.08	NA	0.35	NA	1.43
1952	NA	1.36	NA	0.30	NA	1.66
1953	NA	3.65	NA	0.37	NA	4.02
1954	NA	4.06	NA	0.55	NA	4.61
1955	NA	5.27	NA	0.76	NA	6.03
1956	NA	7.29	NA	1.50	NA	8.79
1957	NA	7.35	NA	1.85	NA	9.20
1958	25.32	3.76	22.93	3.49	48.25	7.25
1959	16.25	2.37	19.59	3.28	35.84	5.65
1960	7.34	1.40	24.40	4.21	31.73	5.61
1961	8.26	1.32	19.31	3.19	27.57	4.51
1962	6.44	1.48	12.87	2.43	19.31	3.91
1963	8.47	0.88	13.53	1.98	22.01	2.86
1964	5.97	0.97	9.91	1.25	15.88	2.21
1965	6.23	1.16	7.33	0.95	13.56	2.11
1966	5.75	1.80	13.18	2.40	18.93	4.20
1967	12.79	5.44	16.95	5.33	29.74	10.76
1968	38.47	16.23	19.53	7.53	58.00	23.75
1969	47.85	20.47	28.01	9.39	75.86	29.86
1970	43.98	17.98	14.87	5.55	58.85	23.53
1971	28.42	11.40	10.44	4.05	38.86	15.45
1972	26.91	11.82	9.71	3.61	36.62	15.42
1973	22.56	10.83	11.70	5.59	34.26	16.42
1974	27.40	16.00	12.30	6.00	39.70	22.00
1975	34.29	16.54	21.60	9.00	55.89	25.54
1976	40.41	19.53	27.23	14.70	67.64	34.23
1977	62.60	25.92	30.86	14.63	93.45	40.55
1978	75.07	32.20	29.29	14.80	104.35	47.00
1979	60.46	26.84	30.19	13.93	90.65	40.77
1980	39.61	19.95	20.19	7.91	59.80	27.86
1981	17.75	10.87	8.67	3.35	26.42	14.22
1982	6.97	4.23	3.00	1.13	9.97	5.36
1983	4.29	2.09	3.01	1.08	7.30	3.17
1984	4.80	2.26	0.72	0.29	5.52	2.55
1985	2.88	1.42	0.77	0.34	3.65	1.76
1986	1.99	1.10	1.85	0.97	3.83	2.07
1987	1.82	1.11	1.99	0.86	3.81	1.96

[1] Includes surface drilling in search of new ore deposits or extensions of known deposits, and drilling at the location of a discovery up to the time the company decides sufficient ore reserves are present to justify commercial exploitation.

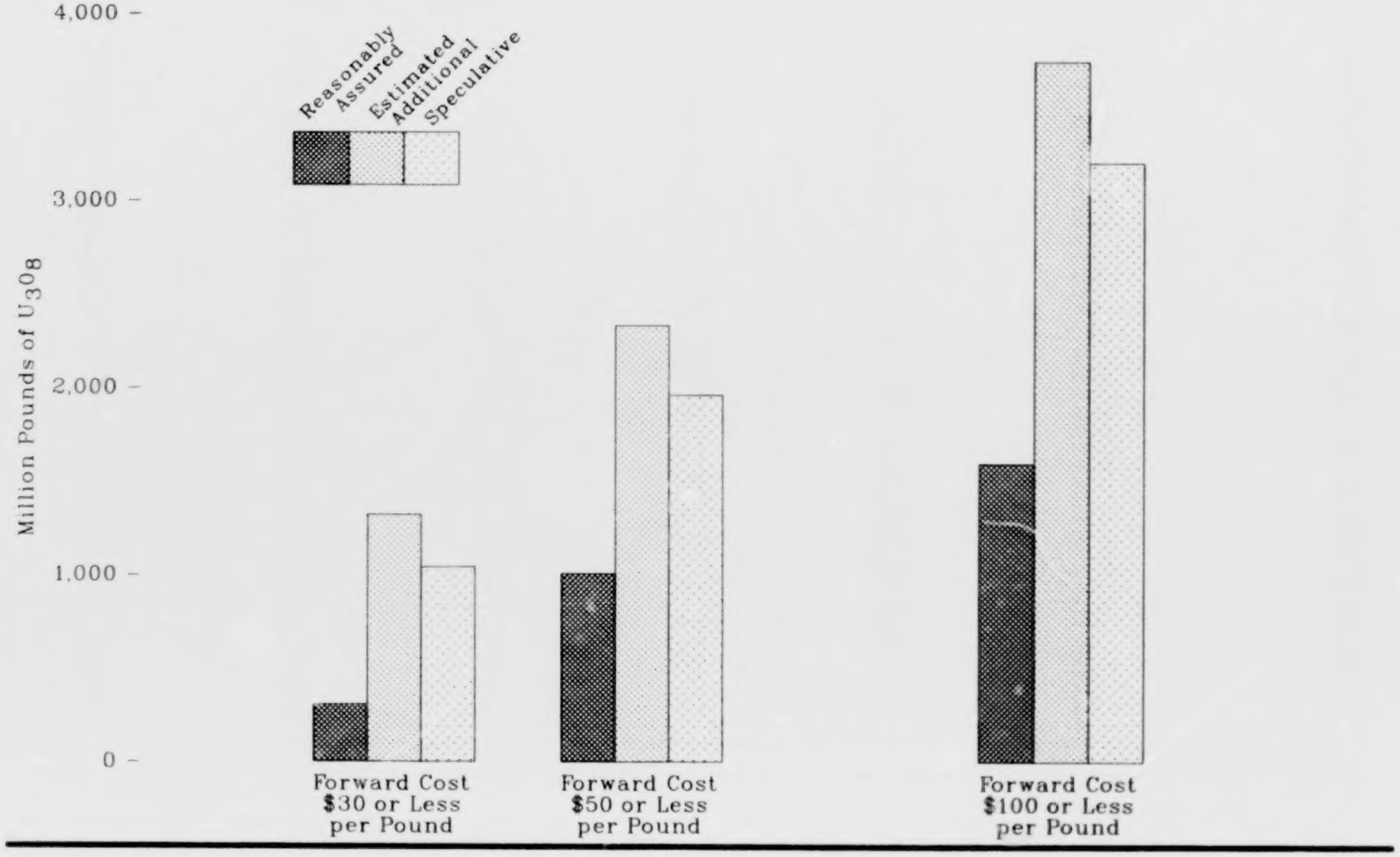
[2] Includes all surface drilling of an ore deposit to determine more precisely size, grade, and configuration subsequent to the time that commercial exploitation is deemed feasible.

NA = Not available.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1949 through 1980—U.S. Department of Energy, Grand Junction Office, *Statistical Data of the Uranium Industry*, January 1, 1983, GJO-100 (annual). •1981 through 1983—Energy Information Administration, *Survey of U.S. Uranium Exploration 1983*. •1984 and forward—Energy Information Administration, *Uranium Industry Annual*.

Figure 47. Uranium Resources, December 31, 1987



Source: See Table 47.

Table 47. Uranium Resources, December 31, 1987

(Million Pounds, U_3O_8)

Resource Category	Forward Cost Category (dollars per pound)[1]		
	$30 or Less	$50 or Less	$100 or Less
Discovered Resources			
Reasonable Assured Resources			
New Mexico	178	450	679
Wyoming	70	350	610
Texas	13	36	64
Arizona, Colorado, Utah	21	105	146
Others[2]	22	64	93
Total[3]	304	1,005	1,592
Undiscovered Resources			
Estimated Additional Resources	1,320	2,330	3,740
Speculative Resources	1,040	1,960	3,200

[1] Forward costs are all operating and capital costs (in current dollars) still to be incurred in the production of uranium from estimated resources. Excluded are previous expenditures (such as exploration and land acquisitions) taxes, profit, and the cost of money. Generally, forward costs are lower than market prices.

[2] Includes California, Idaho, Montana, Nebraska, Nevada, North Dakota, Oregon, South Dakota, and Washington.

[3] Does not include an estimated 51 million pounds of $30 per pound reserves from byproduct recovery facilities.

Source: Energy Information Administration, *Uranium Industry Annual 1987* (September 1988).

5. Petroleum

Fluctuations in the Price of Crude Oil

After successive price hikes had brought the real price[1] of crude oil to a peak in 1981, oil prices began trending downward in 1982, and then plummeted in 1986 (65).[2] The average annual composite refiner acquisition cost of a barrel of crude oil fell from $24.12 in 1985 to $12.77 in 1986. In 1987, oil prices recovered somewhat and averaged $15.21, only to decline to $12.09 in 1988.

Of the several factors contributing to the unprecedented decline in crude oil prices during the first half of 1986, the most important was excess worldwide production—primarily by members of the Organization of Petroleum Exporting Countries (OPEC) seeking to regain market share. OPEC's expanded use of netback pricing agreements caused uncertainty in world oil markets, prolonging the slump. In 1987, oil prices were higher and more stable, due in part to OPEC's closer adherence to its self-imposed production quotas during the first several months of the year. In 1988, however, OPEC production rose 10 percent (105), contributing to weaker prices for the year.

The swings in crude oil prices often were reflected (though in attenuated form) in changes in the retail prices of petroleum products (67). For example, the average annual price per gallon, in real terms, of unleaded regular motor gasoline declined from $1.08 in 1985 to $0.81 in 1986 and 1987. However, crude oil price is not the only component of motor gasoline price; refining and distribution costs and taxation are also major determinants of the retail price. In 1988, the real price per gallon of unleaded regular motor gasoline fell only 3 percent, despite the 21-percent decline in the composite refiner acquisition cost of crude oil.

Consumption of Petroleum Products

Consumption of petroleum products (petroleum products supplied) increased throughout the 1949-to-1973 period, at an average annual rate of 4.7 percent, and by 1973, consumption of petroleum products totaled 17 million barrels per day (48). In 1974, however, marked increases in the price of crude oil coupled with a petroleum supply interruption resulted in a consumption decline of 3.8 percent. Although demand recovered during the late 1970's, peaking at 19 million barrels per day in 1978, by 1983 it had declined to 15 million barrels per day. After that, lower crude oil prices tended to promote consumption. In 1988, low oil prices, continued economic growth, and adverse weather conditions combined to boost petroleum consumption to 17 million barrels per day.

Petroleum Stocks and the Strategic Petroleum Reserve

The U.S. Government established the Strategic Petroleum Reserve (SPR) in response to the oil supply disruptions of the early 1970's. Intended to minimize the effects of any future disruptions, the SPR began storing crude oil in 1977, and by the end of 1988, the Reserve held 560 million barrels (62).

One measure of the Reserve's adequacy is the number of days of petroleum net imports it could provide in the event of an oil supply interruption. Through 1985, that measure of energy security increased every year, due to additions to the Reserve and a decline in the level of net imports. In 1986, however, the measure declined for the first time, from 115 days in 1985 to 94 days in 1986. Due to increasing net imports, by 1988 the measure had fallen to 88 days.

At the end of 1988, SPR stocks plus 331 million barrels of privately held crude oil stocks totaled 891 million barrels (61). Private stocks of crude oil were about equal to the 340-million-barrel level recorded in 1977, when filling of the SPR began, but, at 709 million barrels, private stocks of petroleum products in 1988 remained considerably below the record level of 964 million barrels recorded in 1977.

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[1] Real prices are expressed in constant 1982 dollars.

[2] Numbers in parentheses indicate related tables. Annual data are the most recent available and frequently are preliminary.

Motor gasoline consistently accounts for the largest share of all petroleum products supplied (58). From 1949 through 1988, its share was between 38 percent and 43 percent of supply. After peaking in 1978 at 7.4 million barrels per day, consumption declined somewhat and then stabilized at about 6.6 million barrels per day during the early 1980's.

After 1982, declines in motor gasoline prices sparked renewed growth in demand, and demand remained strong throughout 1988. The fuel efficiency of the fleet (22) continued to increase through 1987 (the most recent year for which data are available), tending to depress demand, but other factors more than offset the increase in efficiency. In 1987, increased highway travel, spurred by higher real disposable income, and legislation allowing travel at higher speeds (at which vehicles are less efficient) combined to keep demand strong.

In contrast, consumption of residual fuel oil declined markedly after 1977, accounting for a smaller and smaller share of all products supplied, as major consumers switched to coal and uranium. Residual fuel consumption had reached an all-time high in 1977 of 3.1 million barrels per day, 17 percent of supply (58). After 8 years of decline, consumption had fallen to 1.2 million barrels per day, less than 8 percent of products supplied, in 1985. Sharply lower oil prices in 1986 encouraged demand for residual fuel, and consumption rose to 1.4 million barrels per day. Demand slackened in 1987 and 1988 to about 1.3 million barrels per day, again less than 8 percent of products supplied.

Production and Productivity

During much of the 1950's and 1960's, production capacity exceeded demand to such an extent that mechanisms such as production prorationing and import ceilings were implemented to protect domestic production. By the 1970's, however, petroleum demand had increased and production neared 100 percent of capacity. The average productivity of wells began to decline, and oil production leveled off (49). Increases in Alaskan production at the end of the decade and through 1988 counteracted declines in Lower-48 production. Nevertheless, by 1988 daily domestic production had declined to 8.1 million barrels, down from 9.6 million barrels produced in the peak year of 1970.

Of total U.S. production in 1988, 86 percent came from onshore wells and 14 percent from offshore. The 612 thousand producing wells attained an average productivity of 13 barrels per well per day, down 1 percent from the 1987 level and significantly below peak productivity of over 18 barrels attained in 1972.

Imports and Exports

Despite import quotas, net imports of low-priced petroleum increased throughout most of the 1949-to-1973 period, and in 1973 totaled 6.0 million barrels per day (48). Thereafter, net imports fluctuated, peaking at 8.6 million barrels per day in 1977, then declining to 4.3 million barrels per day in 1985. In 1986, excess world production drove prices down, inhibiting domestic production and boosting demand. Those factors, as well as stockbuilding, resulted in an increase in net imports to 5.4 million barrels per day. Subsequently, with prices significantly below peak levels, daily net imports rose to 5.9 million barrels in 1987 and 6.4 million barrels in 1988.

U.S. dependence on petroleum net imports peaked at 47 percent of consumption in 1977, then fell in 1985 to 27 percent, the lowest level since 1971 (54). By 1988, it had risen to 37 percent, and dependence on net imports from members of OPEC had risen from 12 percent of consumption in 1985 to 20 percent in 1988. Mexico was the major source of U.S. petroleum net imports in 1982 through 1985, but in 1986 through 1988, Saudi Arabia, Canada, and Venezuela each supplied more petroleum to the United States than did Mexico.

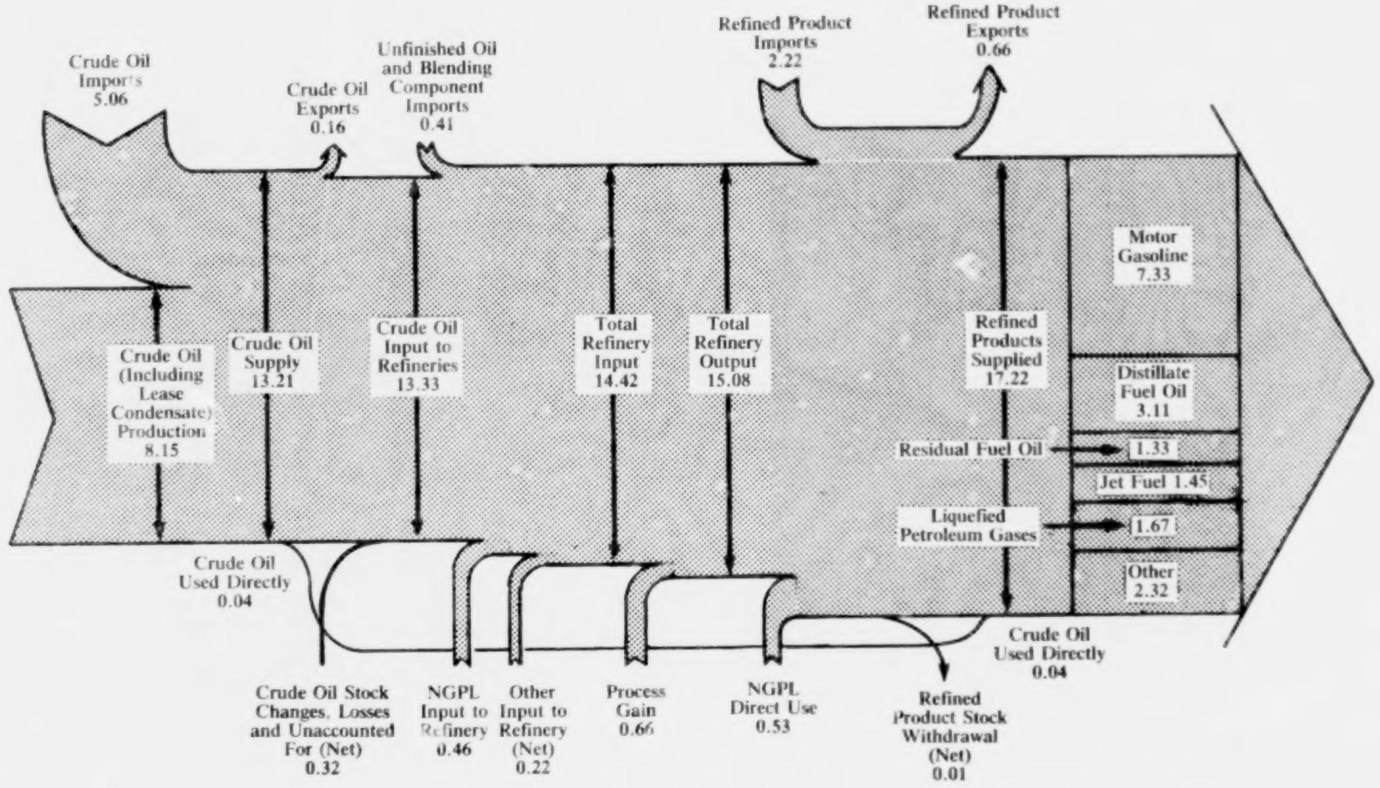
From 1973 on, crude oil net imports surpassed petroleum product net imports; in 1988, the ratio was over 3 to 1 (50 and 52). Net imports of residual fuel accounted for 27 percent of all product net imports in 1988.

The Refining Industry in a Changing Market

The average daily output from U.S. refineries trended upward from 1949 through 1978, when it peaked at 16 million barrels per day (55). During the next 5 years, ouput declined, falling to 13 million barrels per day in 1983. As crude oil prices declined in the mid-1980's and the demand for petroleum rose, refinery output began to recover, reaching 15 million barrels per day by 1988.

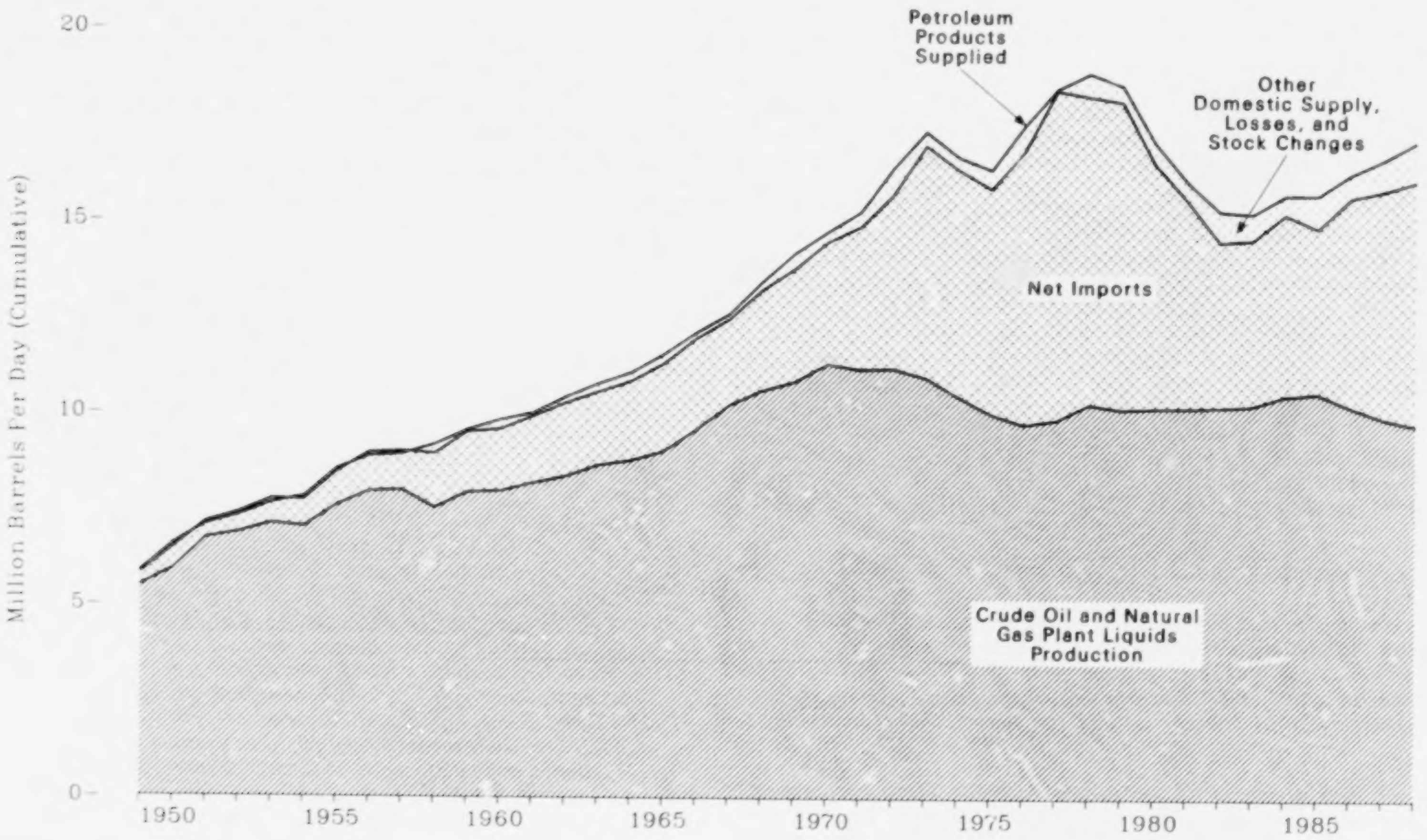
The rate of refinery utilization fell below 80 percent in 1980 through 1985, but improved thereafter (56). In 1986, the utilization rate was 83 percent, well above its nadir of 69 percent in 1981. Margins guaranteed by netback pricing agreements and decommissioning of less efficient refineries in 1986 both contributed to improvement within the domestic refining industry. In 1988, falling crude oil prices and strong product demand contributed to a utilization rate of 85 percent, an increase of more than 1 percentage point from the 1987 rate.

Diagram 2. Petroleum Flow, 1988
(Million Barrels per Day)


Crude Oil Imports 5.06
Crude Oil Exports 0.16
Unfinished Oil and Blending Component Imports 0.41
Refined Product Imports 2.22
Refined Product Exports 0.66
Crude Oil (Including Lease Condensate) Production 8.15
Crude Oil Supply 13.21
Crude Oil Input to Refineries 13.33
Total Refinery Input 14.42
Total Refinery Output 15.08
Refined Products Supplied 17.22
Motor Gasoline 7.33
Distillate Fuel Oil 3.11
Residual Fuel Oil
1.33
Jet Fuel 1.45
Liquefied Petroleum Gases
1.67
Other 2.32
Crude Oil Used Directly 0.04
Crude Oil Stock Changes, Losses and Unaccounted For (Net) 0.32
NGPL Input to Refinery 0.46
Other Input to Refinery (Net) 0.22
Process Gain 0.66
NGPL Direct Use 0.53
Refined Product Stock Withdrawal (Net) 0.01
Crude Oil Used Directly 0.04

Note: Sum of components may not equal total due to independent rounding.
Sources: See Tables 48, 52, 55, and 58.

Figure 48. Petroleum Overview, 1949-1988



Source: See Table 48.

Table 48. Petroleum Overview, 1949-1988

(Million Barrels per Day)

	Production				Foreign Trade							
					Imports							
Year	Crude Oil [1]	Natural Gas Plant Liquids	Total Production	Other Domestic Supply [2]	Crude Oil [3]	Petroleum Products [4]	Total Imports	Exports	Net Imports [5]	Crude Oil Losses	Change in Stocks [6]	Petroleum Products Supplied
1949	5.05	0.43	5.48	([7])	0.42	0.22	0.65	0.33	0.32	0.04	0.01	5.76
1950	5.41	0.50	5.91	([7])	0.49	0.36	0.85	0.30	0.55	0.05	0.06	6.46
1951	6.16	0.56	6.72	0.01	0.49	0.35	0.84	0.42	0.42	0.03	- 0.10	7.02
1952	6.26	0.61	6.87	0.01	0.57	0.38	0.95	0.43	0.52	0.02	- 0.11	7.27
1953	6.46	0.65	7.11	0.02	0.65	0.39	1.03	0.40	0.63	0.02	- 0.14	7.60
1954	6.34	0.69	7.03	0.02	0.66	0.40	1.05	0.36	0.70	0.03	0.03	7.76
1955	6.81	0.77	7.58	0.04	0.78	0.47	1.25	0.37	0.88	0.04	([7])	8.46
1956	7.15	0.80	7.95	0.04	0.93	0.50	1.44	0.43	1.01	0.05	- 0.18	8.78
1957	7.17	0.81	7.98	0.04	1.02	0.55	1.57	0.57	1.01	0.05	- 0.17	8.81
1958	6.71	0.81	7.52	0.06	0.95	0.75	1.70	0.28	1.42	0.03	0.14	9.12
1959	7.05	0.88	7.93	0.09	0.97	0.81	1.78	0.21	1.57	0.01	- 0.05	9.53
1960	7.04	0.93	7.96	0.15	1.02	0.80	1.81	0.20	1.61	0.01	0.08	9.80
1961	7.18	0.99	8.17	0.18	1.05	0.87	1.92	0.17	1.74	0.01	- 0.11	9.98
1962	7.33	1.02	8.35	0.18	1.13	0.96	2.08	0.17	1.91	0.01	- 0.03	10.40
1963	7.54	1.10	8.64	0.20	1.13	0.99	2.12	0.21	1.91	0.01	([7])	10.74
1964	7.61	1.15	8.77	0.22	1.20	1.06	2.26	0.20	2.06	0.01	- 0.01	11.02
1965	7.80	1.21	9.01	0.22	1.24	1.23	2.47	0.19	2.28	0.01	0.01	11.51
1966	8.30	1.28	9.58	0.25	1.22	1.35	2.57	0.20	2.37	0.01	- 0.10	12.08
1967	8.81	1.41	10.22	0.29	1.13	1.41	2.54	0.31	2.23	0.01	- 0.17	12.56
1968	9.10	1.50	10.60	0.35	1.29	1.55	2.84	0.23	2.61	0.01	- 0.15	13.39
1969	9.24	1.59	10.83	0.34	1.41	1.76	3.17	0.23	2.93	0.01	0.05	14.14
1970	9.64	1.66	11.30	0.35	1.32	2.10	3.42	0.26	3.16	0.01	- 0.10	14.70
1971	9.46	1.69	11.16	0.44	1.68	2.25	3.93	0.22	3.70	0.01	- 0.07	15.21
1972	9.44	1.74	11.18	0.44	2.22	2.53	4.74	0.22	4.52	0.01	0.23	16.37
1973	9.21	1.74	10.95	0.49	3.24	3.01	6.26	0.23	6.02	0.01	- 0.14	17.31
1974	8.77	1.69	10.46	0.49	3.48	2.64	6.11	0.22	5.89	0.01	- 0.18	16.65
1975	8.37	1.63	10.01	0.51	4.10	1.95	6.06	0.21	5.85	0.01	- 0.03	16.32
1976	8.13	1.60	9.74	0.59	5.29	2.03	7.31	0.22	7.09	0.01	0.06	17.46
1977	8.24	1.62	9.86	0.57	6.61	2.19	8.81	0.24	8.56	0.02	- 0.55	18.43
1978	8.71	1.57	10.27	0.49	6.36	2.01	8.36	0.36	8.00	0.02	0.09	18.85
1979	8.55	1.58	10.14	0.58	6.52	1.94	8.46	0.47	7.99	0.02	- 0.17	18.51
1980	8.60	1.57	10.17	0.68	5.26	1.65	6.91	0.54	6.36	0.01	- 0.14	17.06
1981	8.57	1.61	10.18	0.64	4.40	1.60	6.00	0.59	5.40	([7])	- 0.16	16.06
1982	8.65	1.55	10.20	0.65	3.49	1.63	5.11	0.82	4.30	([7])	0.15	15.30
1983	8.69	1.56	10.25	0.65	3.33	1.72	5.05	0.74	4.31	([7])	0.02	15.23
1984	8.88	1.63	10.51	0.78	3.43	2.01	5.44	0.72	4.72	([7])	- 0.28	15.73
1985	8.97	1.61	10.58	0.76	3.20	1.87	5.07	0.78	4.29	([7])	0.10	15.73
1986	8.68	1.55	10.23	0.81	4.18	2.05	6.22	0.78	5.44	([7])	- 0.20	16.28
1987	8.35	1.60	9.94	0.85	4.67	2.00	6.68	0.76	5.91	([7])	- 0.04	16.67
1988[8]	8.13	1.62	9.75	1.04	5.05	2.13	7.17	0.82	6.35	([7])	0.02	17.17

[1] Includes lease condensate. [2] Includes benzol, other hydrocarbons, hydrogen, alcohol, processing gains, and unaccounted for crude oil. [3] Includes imports for the Strategic Petroleum Reserve, which began in 1977. [4] For 1981 and forward, includes motor gasoline blending components, and aviation gasoline blending components. [5] Net trade = imports minus exports. [6] Negative numbers denote a net addition to stocks or a reduction in supply. Positive numbers denote a net withdrawal from stocks or an addition to supply. [7] Less than 5,000 barrels per day. [8] Preliminary. Note: Sum of components may not equal total due to independent rounding. Sources: •1949 through 1975—Bureau of Mines, Mineral Industry Surveys, *Petroleum Statement, Annual*. •1976 through 1980—Energy Information Administration, Energy Data Reports, *Petroleum Statement, Annual*. •1981 through 1987—Energy Information Administration, *Petroleum Supply Annual*. •1988—Energy Information Administration, *Petroleum Supply Monthly* December 1988 (February 1989).

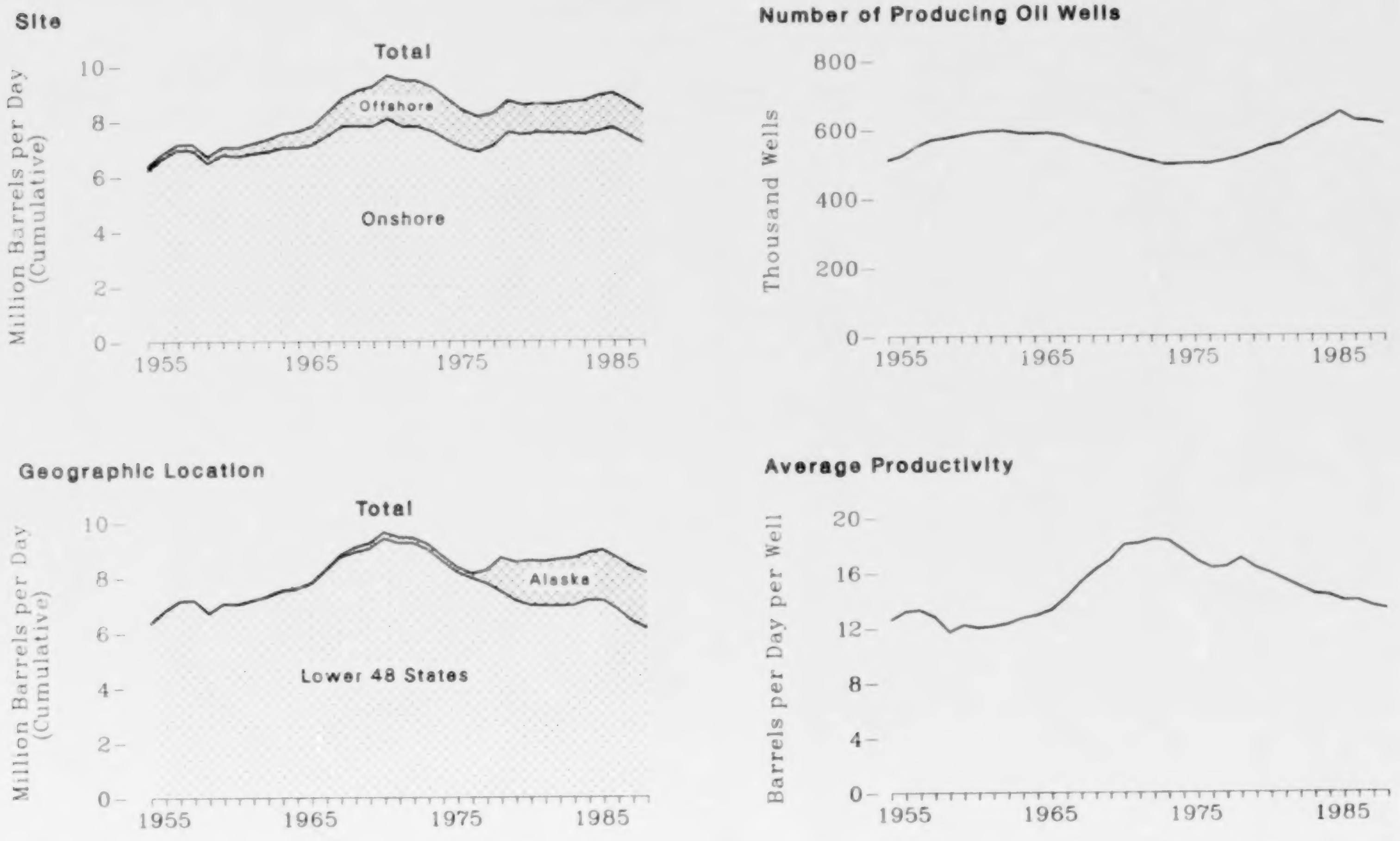


Figure 49. Crude Oil and Lease Condensate Production and Oil Well Productivity, 1954–1988

Site

Number of Producing Oil Wells

Geographic Location

Average Productivity

Source: See Table 49.

Table 49. Crude Oil and Lease Condensate Production and Oil Well Productivity, 1954-1988

(Thousand Barrels per Day, Except as Noted)

	Geographic Location		Site		Type			Oil Well Productivity	
Year	Lower 48	Alaska	Onshore	Offshore	Crude Oil	Lease Condensate	Total Production	Producing Wells[1] (thousands)	Average Productivity[2] (barrels per day per well)
1954	6,342	0	6,209	133	6,342	(3)	6,342	511	12.6
1955	6,807	0	6,645	162	6,807	(3)	6,807	524	13.2
1956	7,151	0	6,951	201	7,151	(3)	7,151	551	13.3
1957	7,170	0	6,940	229	7,170	(3)	7,170	569	12.8
1958	6,710	0	6,473	236	6,710	(3)	6,710	575	11.7
1959	7,053	1	6,779	274	7,054	(3)	7,054	583	12.2
1960	7,034	2	6,716	319	7,035	(3)	7,035	591	12.0
1961	7,166	17	6,817	365	7,183	(3)	7,183	595	12.1
1962	7,304	28	6,888	444	7,332	(3)	7,332	596	12.3
1963	7,512	29	7,026	515	7,542	(3)	7,542	585	12.7
1964	7,584	30	7,027	587	7,614	(3)	7,614	588	12.9
1965	7,774	30	7,140	665	7,804	(3)	7,804	589	13.3
1966	8,256	39	7,473	823	8,295	(3)	8,295	583	14.2
1967	8,730	80	7,802	1,009	8,810	(3)	8,810	565	15.3
1968	8,915	181	7,808	1,287	8,660	436	9,096	554	16.2
1969	9,035	203	7,797	1,441	8,778	460	9,238	542	16.9
1970	9,408	229	8,060	1,577	9,180	457	9,637	531	18.0
1971	9,245	218	7,779	1,684	9,032	431	9,463	517	18.1
1972	9,242	199	7,780	1,660	8,998	443	9,441	508	18.4
1973	9,010	198	7,592	1,616	8,784	424	9,208	497	18.3
1974	8,581	193	7,285	1,489	8,375	399	8,774	498	17.6
1975	8,183	191	7,012	1,362	8,007	367	8,375	500	16.8
1976	7,958	173	6,868	1,264	7,776	356	8,132	499	16.3
1977	7,781	464	7,069	1,176	7,875	370	8,245	507	16.4
1978	7,478	1,229	7,571	1,136	8,353	355	8,707	517	17.0
1979	7,151	1,401	7,485	1,067	8,181	371	8,552	531	16.3
1980	6,980	1,617	7,562	1,034	8,210	386	8,597	548	15.9
1981	6,962	1,609	7,537	1,034	8,176	395	8,572	557	15.4
1982	6,953	1,696	7,538	1,110	8,261	387	8,649	580	14.9
1983	6,974	1,714	7,492	1,196	8,688	(3)	8,688	603	14.4
1984	7,157	1,722	7,596	1,283	8,879	(3)	8,879	621	14.3
1985	7,146	1,825	7,722	1,250	8,971	(3)	8,971	647	13.9
1986	6,814	1,867	7,426	1,254	8,680	(3)	8,680	623	13.9
1987	6,387	1,962	7,153	1,196	8,349	(3)	8,349	620	13.5
1988[4]	6,112	2,017	6,960	1,168	8,129	(3)	8,129	612	13.3

[1] As of December 31.

[2] For 1954 through 1976, average productivity is based on the average number of producing wells. For 1977 forward, average productivity is based on the number of wells producing at end of year.

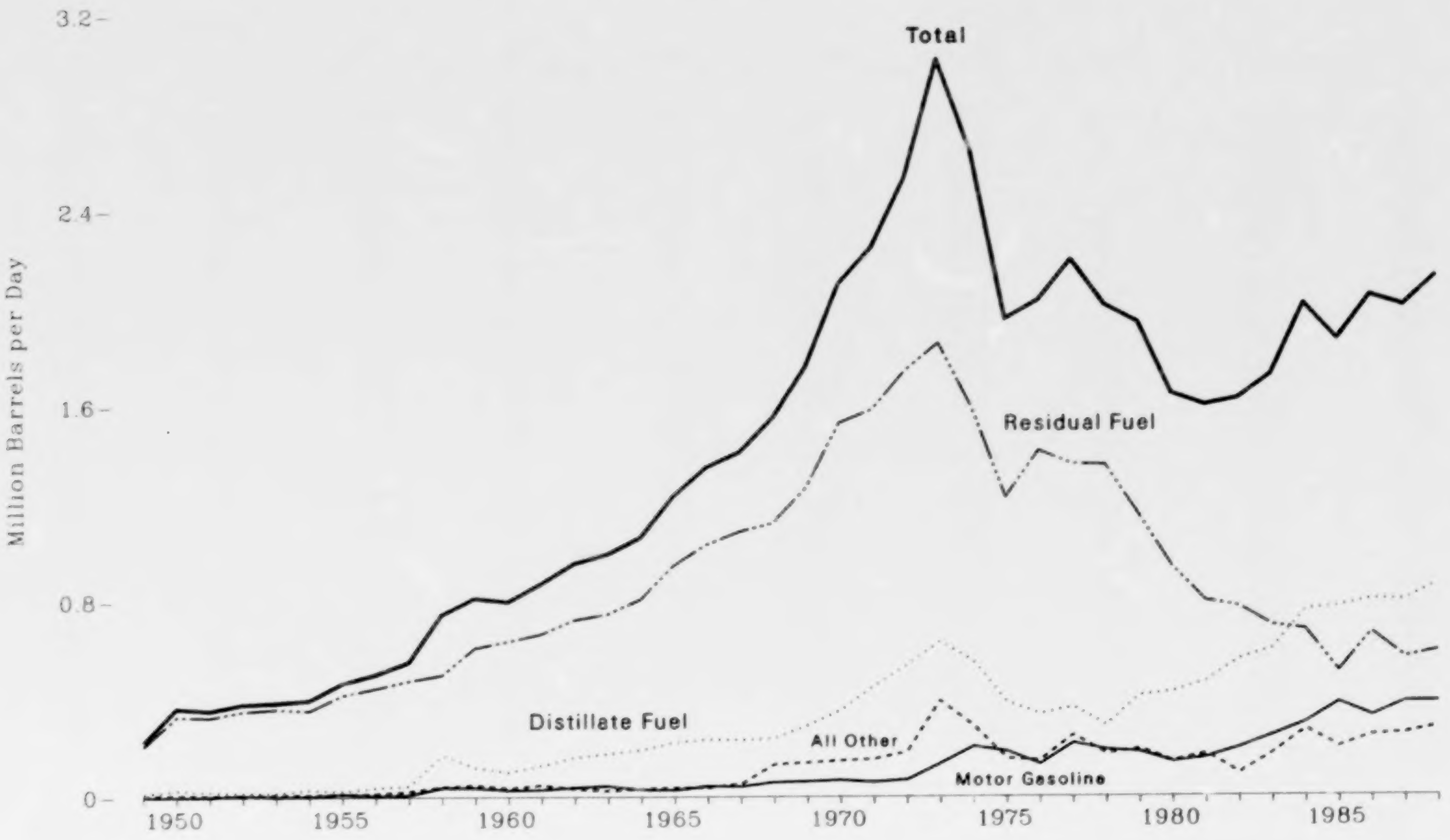
[3] Included in crude oil.

[4] Preliminary.

Note: Sum of components may not equal total due to independent rounding.

Sources: **Offshore:** •1954 through 1969—U.S. Geological Survey, *Outer Continental Shelf Statistics*, June 1979. •1970 through 1975—Bureau of Mines, Mineral Industry Surveys, *Petroleum Statement, Annual*. •1976 through 1980—Energy Information Administration, Energy Data Reports, *Petroleum Statement, Annual*. •1981 through 1987—Energy Information Administration, *Petroleum Supply Annual*. •1988—Energy Information Administration, *Petroleum Supply Monthly*. **Oil Well Productivity:** •1954 through 1975—Bureau of Mines, *Minerals Yearbook*, "Crude Petroleum and Petroleum Products" chapter. •1976 through 1980—Energy Information Administration, Energy Data Reports, *Petroleum Statement, Annual*. •1981 through 1987—Independent Petroleum Association of America, *The Oil Producing Industry in Your State*. •1988—*World Oil*, February 1989. **All Other Data:** •1954 through 1975—Bureau of Mines, Mineral Industry Surveys, *Petroleum Statement, Annual*. •1976 through 1980—Energy Information Administration, Energy Data Reports, *Petroleum Statement, Annual*. •1981 through 1987—Energy Information Administration, *Petroleum Supply Annual*. •1988—Energy Information Administration, *Petroleum Supply Monthly* December 1988 (February 1989).

Figure 50. Petroleum Product Imports by Type, 1949-1988



Source: See Table 50.

Table 50. Petroleum Imports[1] by Type, 1949-1988

(Thousand Barrels per Day)

		Petroleum Products								
Year	Crude Oil[2]	Distillate Fuel Oil	Jet Fuel[3]	Liquefied Petroleum Gases	Motor Gasoline[4]	Residual Fuel Oil	Unfinished Oils	Other Products[5]	Total	Total Petroleum
1949	421	5	NA	0	0	206	10	3	224	645
1950	487	7	NA	0	(6)	329	21	6	363	850
1951	491	5	NA	0	1	326	14	7	354	844
1952	573	7	NA	0	5	351	9	7	380	952
1953	648	9	NA	0	1	360	9	7	386	1,034
1954	656	9	NA	0	3	354	21	9	396	1,052
1955	782	12	NA	0	13	417	15	9	466	1,248
1956	934	14	21	0	5	445	7	10	502	1,436
1957	1,023	23	25	0	8	475	3	18	552	1,574
1958	953	41	57	0	38	499	92	21	747	1,700
1959	965	48	37	0	37	610	63	19	814	1,780
1960	1,015	35	34	4	27	637	45	17	799	1,815
1961	1,045	48	28	5	29	666	69	26	872	1,917
1962	1,126	32	30	6	38	724	89	36	955	2,082
1963	1,131	25	41	7	44	747	87	41	992	2,123
1964	1,198	32	33	11	29	808	89	58	1,060	2,259
1965	1,238	36	81	21	28	946	92	27	1,229	2,468
1966	1,225	38	86	29	43	1,032	97	24	1,348	2,573
1967	1,128	51	89	27	42	1,085	97	20	1,409	2,537
1968	1,291	132	105	32	59	1,120	80	22	1,549	2,840
1969	1,409	139	125	35	62	1,265	106	25	1,757	3,166
1970	1,324	147	144	52	67	1,528	108	49	2,095	3,419
1971	1,681	153	180	70	59	1,583	124	76	2,245	3,926
1972	2,216	182	194	89	68	1,742	125	126	2,525	4,741
1973	3,244	392	212	132	134	1,853	137	152	3,012	6,256
1974	3,477	289	163	123	204	1,587	121	148	2,635	6,112
1975	4,105	155	133	112	184	1,223	36	108	1,951	6,056
1976	5,287	146	76	130	131	1,413	32	97	2,026	7,313
1977	6,615	250	75	161	217	1,359	31	99	2,193	8,807
1978	6,356	173	86	123	190	1,355	27	53	2,008	8,363
1979	6,519	193	78	217	181	1,151	59	58	1,937	8,456
1980	5,263	142	80	216	140	939	55	76	1,646	6,909
1981	4,396	173	38	244	157	800	112	76	1,599	5,996
1982	3,488	93	29	226	197	776	174	131	1,625	5,113
1983	3,329	174	29	190	247	699	234	147	1,722	5,051
1984	3,426	272	62	195	299	681	231	272	2,011	5,437
1985	3,201	200	39	187	381	510	318	232	1,866	5,067
1986	4,178	247	57	242	326	669	250	254	2,045	6,224
1987	4,674	255	67	190	384	565	299	243	2,004	6,678
1988[7]	5,045	282	88	209	384	593	350	220	2,127	7,172

[1] Includes imports from U.S. possessions and territories.

[2] Includes imports for the Strategic Petroleum Reserve, which began in 1977.

[3] Prior to 1965, imports of kerosene-type jet fuel were included with kerosene, which is listed under "Other Products."

[4] Excludes motor gasoline blending components after 1980. Prior to 1964, motor gasoline data were for total gasoline, including motor gasoline, aviation gasoline, and special naphtha.

[5] Includes aviation gasoline, motor gasoline blending components, aviation gasoline blending components, kerosene, petrochemical feedstocks, special naphthas, lubricants, wax, asphalt, petroleum coke, pentanes plus, and miscellaneous products.

[6] Less than 500 barrels per day.

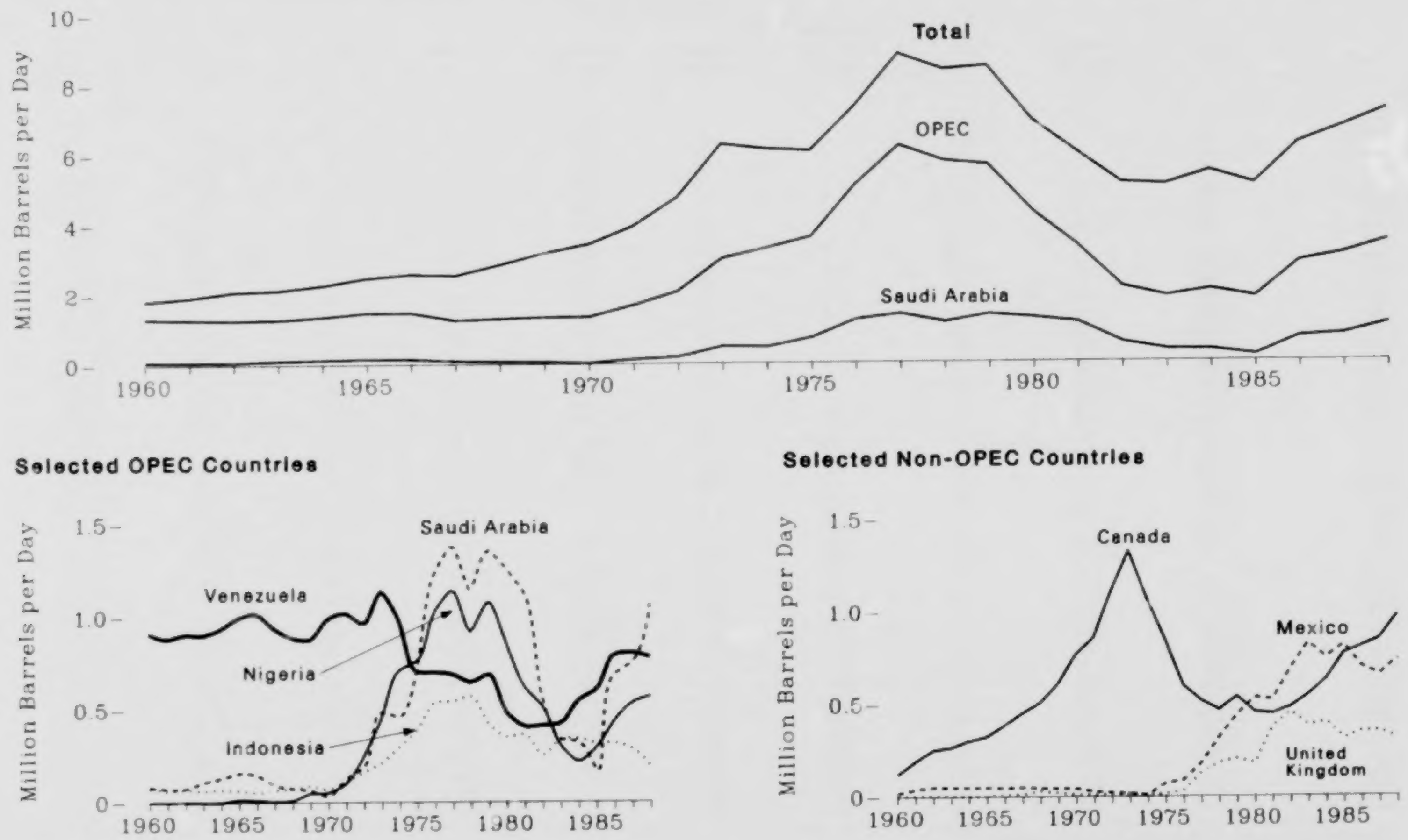
[7] Preliminary.

NA = Not available.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1949 through 1975—Bureau of Mines, Mineral Industry Surveys, *Petroleum Statement, Annual.* • 1976 through 1980—Energy Information Administration, Energy Data Reports, *Petroleum Statement, Annual.* •1981 through 1987—Energy Information Administration, *Petroleum Supply Annual.* •1988—Energy Information Administration, *Petroleum Supply Monthly* December 1988 (February 1989).

Figure 51. Petroleum Imports by Country of Origin, 1960-1988



Source: See Table 51.

Table 51. Petroleum Imports by Country of Origin, 1960-1988

(Thousand Barrels per Day)

	Organization of Petroleum Exporting Countries (OPEC)[1]													
Year	Algeria	Indonesia	Nigeria	Saudi Arabia	Venezuela	Other OPEC[2]	Total OPEC[3]	Total Arab OPEC[4]	Canada	Mexico	United Kingdom	Virgin Is. and Puerto Rico	Other Non-OPEC	Total
1960	1	77	0	84	911	241	1,314	292	120	16	(5)	36	328	1,815
1961	0	62	0	73	879	272	1,286	284	190	40	1	44	357	1,917
1962	0	69	0	74	906	216	1,265	241	250	49	2	41	475	2,082
1963	1	63	0	108	900	211	1,283	258	265	48	3	44	480	2,123
1964	6	68	0	131	933	223	1,361	293	299	47	(5)	47	505	2,259
1965	9	63	15	158	994	237	1,476	324	323	48	(5)	47	574	2,468
1966	4	53	11	147	1,018	238	1,471	300	384	45	6	61	606	2,573
1967	5	66	5	92	938	153	1,259	177	450	49	11	96	673	2,537
1968	6	73	9	74	886	255	1,302	272	506	45	28	145	814	2,840
1969	2	88	49	65	875	256	1,336	276	608	43	20	189	971	3,166
1970	8	70	50	30	989	197	1,343	196	766	42	11	271	985	3,419
1971	15	111	102	128	1,020	296	1,673	327	857	27	10	368	991	3,926
1972	92	164	251	190	959	406	2,063	530	1,108	21	9	432	1,108	4,741
1973	136	213	459	486	1,135	564	2,993	915	1,325	16	15	429	1,479	6,256
1974	190	300	713	461	979	635	3,280	752	1,070	8	8	481	1,265	6,112
1975	282	390	762	715	702	750	3,601	1,383	846	71	14	496	1,026	6,056
1976	432	539	1,025	1,230	700	1,140	5,066	2,424	599	87	31	510	1,019	7,313
1977	559	541	1,143	1,380	690	1,880	6,193	3,185	517	179	126	571	1,221	8,807
1978	649	573	919	1,144	645	1,821	5,751	2,963	467	318	180	522	1,126	8,363
1979	636	420	1,080	1,356	690	1,456	5,637	3,056	538	439	202	523	1,116	8,456
1980	488	348	857	1,261	481	865	4,300	2,551	455	533	176	476	969	6,909
1981	311	366	620	1,129	406	491	3,323	1,848	447	522	375	389	939	5,996
1982	170	248	514	552	412	250	2,146	854	482	685	456	366	979	5,113
1983	240	338	302	337	422	223	1,862	632	547	826	382	322	1,111	5,051
1984	323	343	216	325	548	294	2,049	819	630	748	402	336	1,273	5,437
1985	187	314	293	168	605	264	1,830	472	770	816	310	275	1,066	5,067
1986	271	318	440	685	793	329	2,837	1,162	807	699	350	265	1,267	6,224
1987	295	285	535	751	804	390	3,060	1,274	848	655	352	294	1,469	6,678
1988[6]	294	190	568	1,062	779	535	3,428	1,828	976	740	311	263	1,455	7,172

[1] See Glossary for membership.

[2] "Other OPEC" consists of Ecuador, Gabon, Iran, Iraq, Kuwait, Libya, Qatar, and United Arab Emirates. Prior to 1988, imports from the Neutral Zone between Kuwait and Saudi Arabia are included in imports from Saudi Arabia. From 1988 forward, those imports are included in imports from "Other OPEC."

[3] "Total OPEC" consists of Ecuador, Gabon, Indonesia, Iran, Nigeria, and Venezuela, as well as the Arab members. "Total OPEC" imports exclude petroleum imported into the United States indirectly from OPEC countries, primarily from Caribbean and West European refining areas, as petroleum products that were refined from crude oil produced in OPEC countries.

[4] "Total Arab OPEC" consists of Algeria, Iraq, Kuwait, Libya, Qatar, Saudi Arabia, and United Arab Emirates. Imports from the Neutral Zone are included in imports from "Total Arab OPEC."

[5] Less than 500 barrels per day.

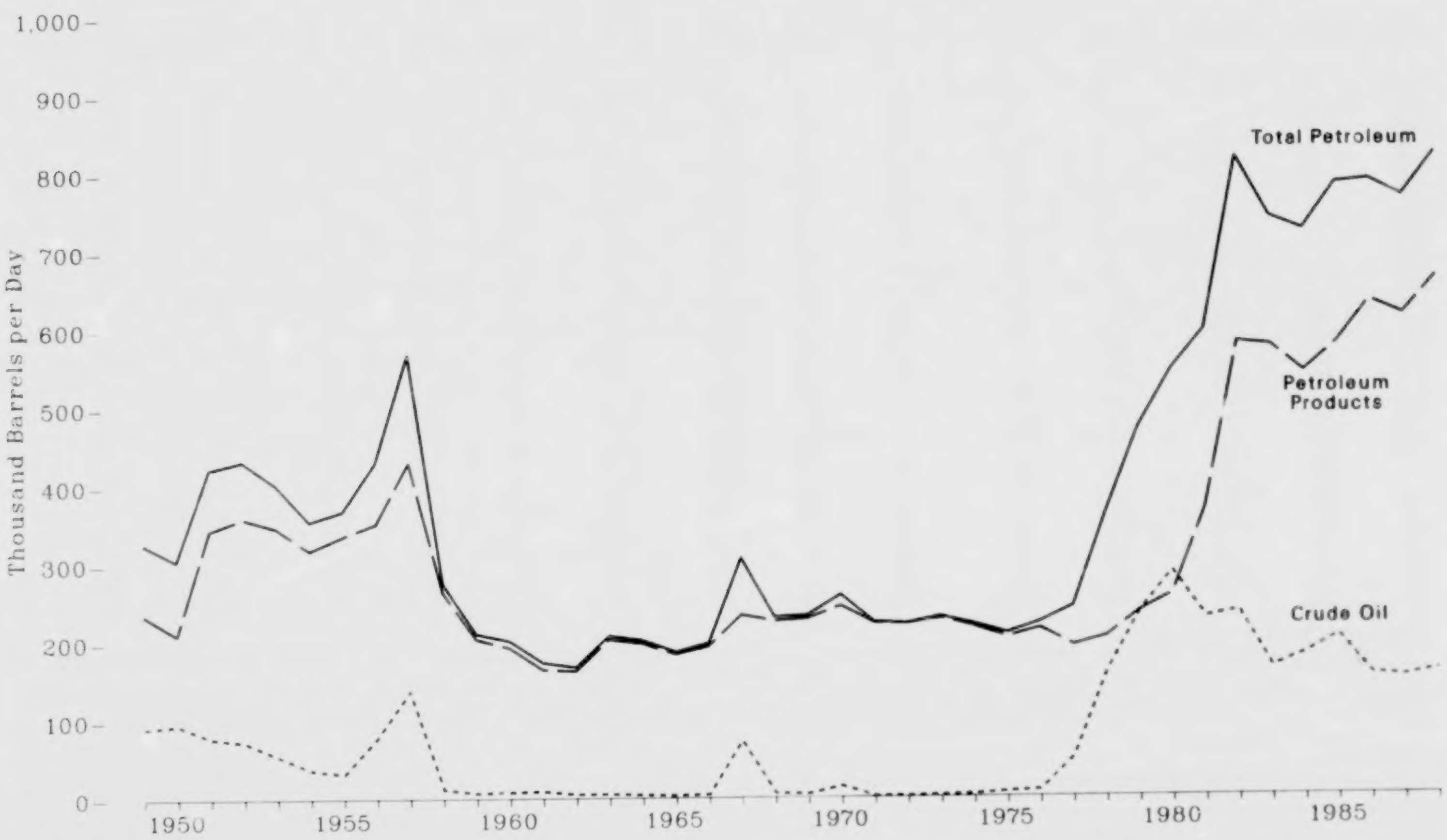
[6] Preliminary.

Note: Data include imports for the Strategic Petroleum Reserve, which began in 1977.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1960 through 1975—Bureau of Mines, *Minerals Yearbook*, "Crude Petroleum and Petroleum Products" Chapter. •1976 through 1980—Energy Information Administration, Energy Data Reports, *P.A.D. Districts Supply/Demand, Annual*. •1981 through 1987—Energy Information Administration, *Petroleum Supply Annual*. •1988—Energy Information Administration, *Petroleum Supply Monthly* December 1988 (February 1989).

Figure 52. Petroleum Exports by Type, 1949–1988



Source: See Table 52.

Table 52. Petroleum Exports[1] by Type, 1949-1988

(Thousand Barrels per Day)

Year	Crude Oil	Petroleum Products: Liquefied Petroleum Gases	Petroleum Products: Lubricants	Petroleum Products: Petroleum Coke	Petroleum Products: Petrochemical Feedstocks	Petroleum Products: Residual Fuel Oil	Petroleum Products: Other Products[2]	Petroleum Products: Total	Total Petroleum
1949	91	4	35	7	0	35	156	236	327
1950	95	4	39	7	0	44	115	210	305
1951	78	6	48	12	0	79	199	344	422
1952	73	7	44	11	0	76	222	359	432
1953	55	8	36	10	0	71	222	347	402
1954	37	11	41	9	0	73	184	318	355
1955	32	12	39	12	0	93	180	336	368
1956	78	12	38	18	0	76	209	352	430
1957	138	12	38	14	0	106	260	430	568
1958	12	8	36	12	0	71	138	264	276
1959	7	6	38	13	0	57	90	204	211
1960	8	8	43	19	0	51	73	193	202
1961	9	10	47	20	0	38	50	165	174
1962	5	11	48	20	0	35	49	163	168
1963	5	13	50	29	0	42	69	203	208
1964	4	15	50	37	5	52	45	198	202
1965	3	21	45	32	7	41	40	184	187
1966	4	22	47	40	8	35	43	194	198
1967	73	25	51	45	8	60	45	234	307
1968	5	29	49	53	11	55	32	226	231
1969	4	35	45	63	10	46	29	229	233
1970	14	27	44	84	14	54	25	245	259
1971	1	26	43	74	13	36	29	223	224
1972	1	31	41	85	19	33	19	222	222
1973	2	27	35	96	15	23	29	229	231
1974	3	25	33	113	22	14	18	218	221
1975	6	26	25	102	30	15	14	204	209
1976	8	25	26	103	24	12	19	215	223
1977	50	18	26	102	23	6	15	193	243
1978	158	20	27	111	31	13	10	204	362
1979	235	15	23	146	29	9	12	236	471
1980	287	21	23	136	26	33	14	258	544
1981	228	42	19	138	24	118	24	367	595
1982	236	65	16	156	20	209	109	579	815
1983	164	73	16	195	21	185	87	575	739
1984	181	48	15	193	19	190	73	541	722
1985	204	62	15	187	22	197	96	577	781
1986	154	42	23	238	20	147	159	631	785
1987	151	38	23	213	23	186	134	613	764
1988[3]	159	49	25	231	23	200	133	661	819

[1] Includes exports to U.S. possessions and territories.

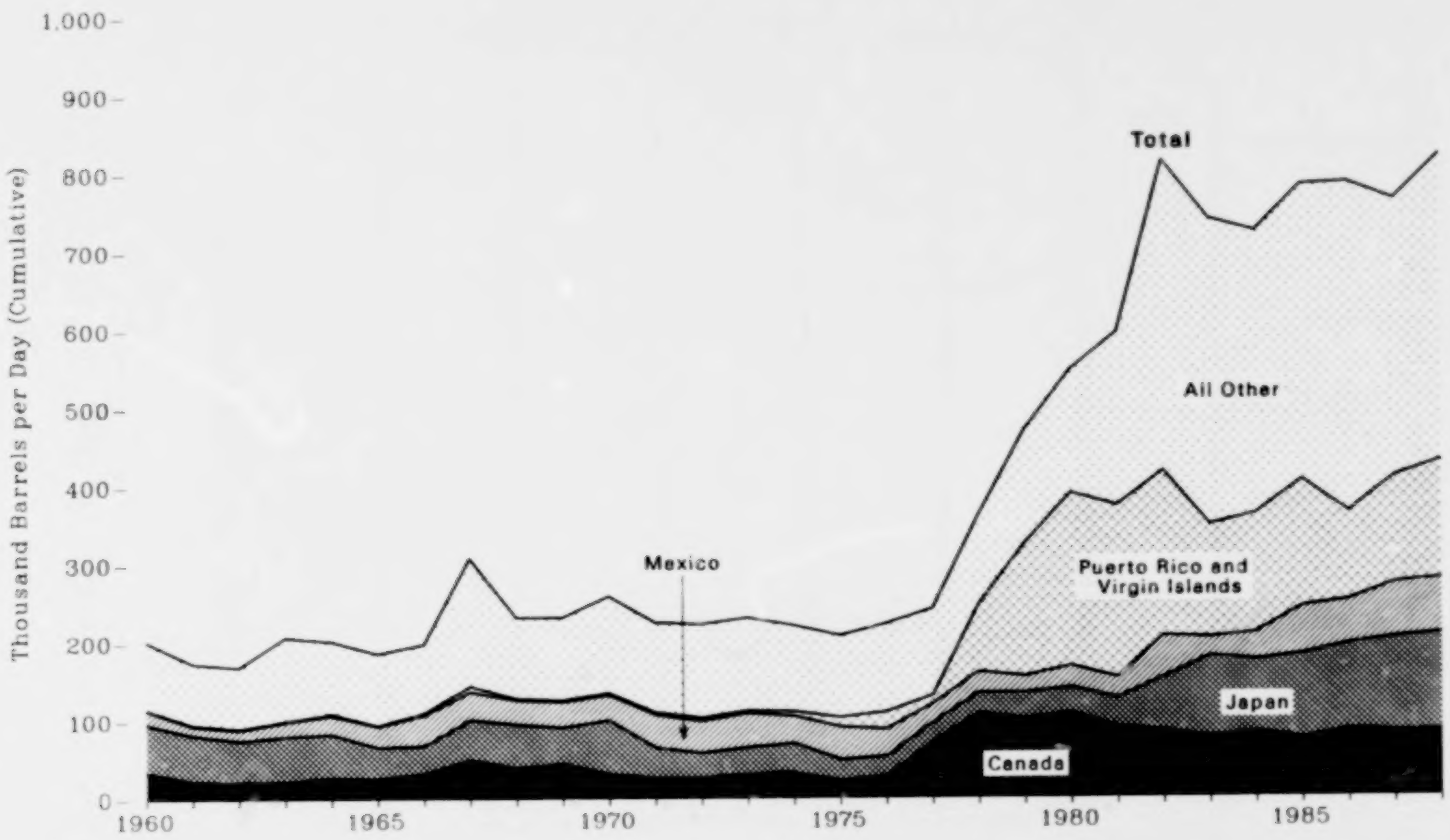
[2] Includes aviation gasoline, motor gasoline, jet fuel, distillate fuel oil, kerosene, special naphthas, wax, asphalt, pentanes plus, and miscellaneous products.

[3] Preliminary.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1949 through 1975—Bureau of Mines, Mineral Industry Surveys, *Petroleum Statement, Annual* •1976 through 1980—Energy Information Administration, Energy Data Reports, *Petroleum Statement, Annual* •1981 through 1987—Energy Information Administration, *Petroleum Supply Annual* •1988—Energy Information Administration, *Petroleum Supply Monthly* December 1988 (February 1989).

Figure 53. Petroleum Exports by Country of Destination, 1960–1988



Source: See Table 53.

Table 53. Petroleum Exports by Country of Destination, 1960-1988

(Thousand Barrels per Day)

Year	Canada	Mexico	Japan	Netherlands	Belgium[1]	Italy	United Kingdom	France	Brazil	Puerto Rico	Virgin Islands	Other	Total
1960	34	18	62	6	3	6	12	4	4	1	NA	52	202
1961	23	12	59	4	4	5	10	4	4	1	(2)	48	174
1962	21	14	54	5	3	5	8	3	5	1	(2)	50	168
1963	22	19	58	13	9	8	11	4	4	1	(2)	59	208
1964	27	24	56	9	4	8	10	4	4	1	1	55	202
1965	26	27	40	10	3	7	12	3	3	1	1	54	187
1966	32	39	36	9	3	7	12	4	4	3	(2)	49	198
1967	50	36	51	13	5	9	62	3	6	7	(2)	65	307
1968	39	31	56	10	4	8	14	4	8	2	(2)	55	231
1969	44	33	47	9	4	9	13	4	7	2	1	59	233
1970	31	33	69	15	5	10	12	5	7	1	(2)	71	259
1971	26	42	39	11	7	8	9	5	9	3	(2)	67	224
1972	26	41	32	12	13	9	10	5	9	3	(2)	63	222
1973	31	44	34	13	15	9	9	5	8	3	(2)	60	231
1974	32	35	38	17	13	9	6	4	9	4	2	52	221
1975	22	42	27	23	9	10	7	6	6	5	7	44	209
1976	28	35	25	22	12	10	13	6	7	21	1	43	223
1977	71	24	25	17	16	10	9	9	6	6	5	44	243
1978	108	27	26	18	15	10	7	9	8	44	42	47	362
1979	100	21	34	28	19	15	7	13	7	64	106	57	471
1980	108	28	32	23	20	14	7	11	4	86	134	79	544
1981	89	26	38	42	12	22	5	15	1	81	140	124	595
1982	85	53	68	85	17	32	14	24	8	95	116	216	815
1983	76	24	104	49	22	35	8	23	2	33	111	251	739
1984	83	35	92	37	21	39	14	18	1	24	128	229	722
1985	74	61	108	44	26	30	14	11	3	26	135	248	781
1986	85	56	110	58	30	39	8	11	3	14	98	273	785
1987	83	70	120	39	17	42	6	12	2	22	114	236	764
1988[3]	84	70	124	26	25	29	9	12	3	21	129	286	819

[1] Including Luxembourg.

[2] Less than 500 barrels per day.

[3] Preliminary.

NA = Not available.

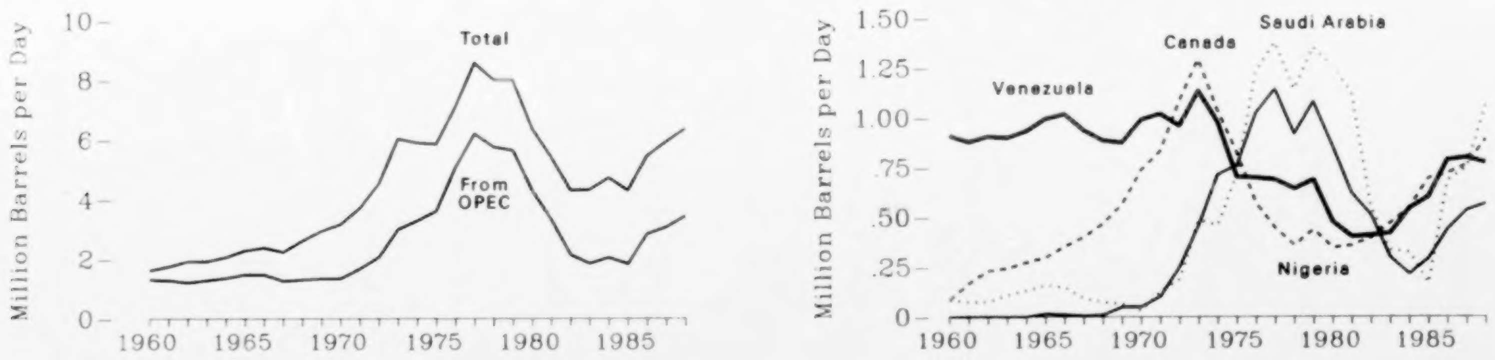
Note: Sum of components may not equal total due to independent rounding.

Sources: •1960 through 1975—Bureau of Mines, Mineral Industry Surveys, *Petroleum Statement, Annual.* •1976 through 1980—Energy Information Administration, Energy Data Reports, *Petroleum Statement, Annual.* •1981 through 1987—Energy Information Administration, *Petroleum Supply Annual.* •1988—Energy Information Administration, *Petroleum Supply Monthly* December 1988 (February 1989).

Figure 54. Petroleum Net Imports by Country of Origin, 1960-1988

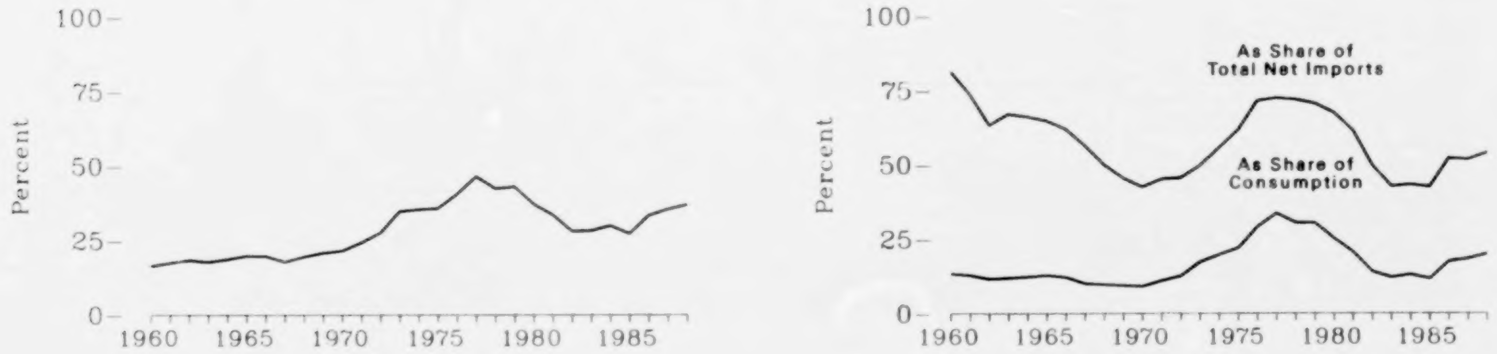
Total Net Imports

Net Imports from Selected Countries



Total Net Imports As Share of Consumption

Net Imports from OPEC



Source: See Table 54.

Table 54. Petroleum Net Imports[1] by Country of Origin, 1960-1988

(Thousand Barrels per Day, Except as Shown)

Year	Organization of Petroleum Exporting Countries (OPEC)						Canada	Mexico	United Kingdom	Virgin Is. and Puerto Rico	Other Non-OPEC	Total Net Imports	Total Net Imports as Percent of Consumption[5]	Net Imports from OPEC	
	Nigeria	Saudi Arabia	Venezuela	Other OPEC[2]	Total OPEC[3]	Total Arab OPEC[4]								As Percent of Total Net Imports[6]	As Percent of Consumption[7]
1960	0	84	910	317	1,311	292	86	-2	-12	34	195	1,613	16.5	81.3	13.4
1961	0	73	878	333	1,283	284	167	27	-10	42	232	1,743	17.5	73.6	12.9
1962	0	74	905	232	1,210	241	229	35	-6	40	405	1,913	18.4	63.3	11.6
1963	0	108	899	274	1,282	258	243	29	-7	43	325	1,915	17.8	67.0	11.9
1964	0	131	932	296	1,359	293	272	23	-9	45	368	2,057	18.7	66.1	12.3
1965	15	158	994	308	1,475	324	297	21	-11	45	454	2,281	19.8	64.7	12.8
1966	11	147	1,018	295	1,470	291	352	6	-6	58	494	2,375	19.7	61.9	12.2
1967	5	92	937	224	1,258	177	400	13	-51	89	521	2,230	17.8	56.4	10.0
1968	9	74	886	332	1,302	272	468	15	13	143	668	2,609	19.5	49.9	9.7
1969	49	65	875	346	1,336	276	564	10	7	186	831	2,933	20.8	45.5	9.5
1970	50	30	989	274	1,343	196	736	9	-1	270	804	3,161	21.5	42.5	9.1
1971	102	128	1,019	422	1,671	327	831	-14	1	365	848	3,701	24.3	45.2	11.0
1972	251	189	959	662	2,061	529	1,082	-20	-1	428	969	4,519	27.6	45.6	12.6
1973	459	485	1,134	913	2,991	914	1,294	-28	(*)	426	1,343	6,025	34.8	49.6	17.3
1974	713	461	978	1,125	3,277	752	1,038	-27	1	475	1,127	5,892	35.4	55.6	19.7
1975	762	714	702	1,421	3,599	1,382	824	29	7	484	904	5,846	35.8	61.6	22.1
1976	1,025	1,229	699	2,110	5,063	2,423	571	53	24	488	891	7,090	40.6	71.4	29.0
1977	1,143	1,379	689	2,978	6,190	3,184	446	155	117	560	1,097	8,565	46.5	72.3	33.6
1978	919	1,142	644	3,042	5,747	2,962	359	291	173	436	996	8,002	42.5	71.8	30.5
1979	1,080	1,354	688	2,510	5,633	3,054	438	418	196	353	948	7,985	43.1	70.5	30.4
1980	857	1,259	478	1,699	4,293	2,549	347	506	169	256	794	6,365	37.3	67.5	25.2
1981	620	1,128	403	1,165	3,315	1,844	358	497	370	169	693	5,401	33.6	61.4	20.6
1982	512	551	409	663	2,136	852	397	632	442	154	538	4,298	28.1	49.7	14.0
1983	299	336	420	788	1,843	630	471	802	374	178	644	4,312	28.3	42.7	12.1
1984	215	324	544	953	2,037	817	547	714	388	184	847	4,715	30.0	43.2	13.0
1985	293	167	602	759	1,821	470	696	755	295	114	605	4,286	27.3	42.5	11.6
1986	440	685	788	915	2,828	1,160	721	642	342	152	753	5,439	33.4	52.0	17.4
1987	535	751	801	968	3,055	1,273	765	585	346	158	1,006	5,914	35.5	51.7	18.3
1988[P]	568	1,061	775	1,017	3,421	1,826	892	670	301	112	957	6,353	37.0	53.8	19.9

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[1] Imports minus exports; negative numbers indicate that exports exceed imports.

[2] "Other OPEC" consists of Algeria, Ecuador, Gabon, Indonesia, Iran, Iraq, Kuwait, Libya, Qatar, and United Arab Emirates. Prior to 1988, imports from the Neutral Zone between Kuwait and Saudi Arabia are included in imports from Saudi Arabia. From 1988 forward, those imports are included in imports from "Other OPEC."

[3] "Total OPEC" consists of Ecuador, Gabon, Indonesia, Iran, Nigeria, and Venezuela, as well as the Arab members. "Total OPEC" imports exclude petroleum imported into the United States indirectly from OPEC countries, primarily from Caribbean and West European refining areas, as petroleum products that were refined from crude oil produced in OPEC countries.

[4] "Total Arab OPEC" consists of Algeria, Iraq, Kuwait, Libya, Qatar, Saudi Arabia, and United Arab Emirates. Imports from the Neutral Zone are included in imports from "Total Arab OPEC."

[5] Calculated by dividing total net petroleum imports by total U.S. petroleum products supplied (consumption).

[6] Calculated by dividing net petroleum imports from OPEC countries by total net petroleum imports.

[7] Calculated by dividing net petroleum imports from OPEC countries by total U.S. petroleum product supplied (consumption).

[*] Less than 500 barrels per day.

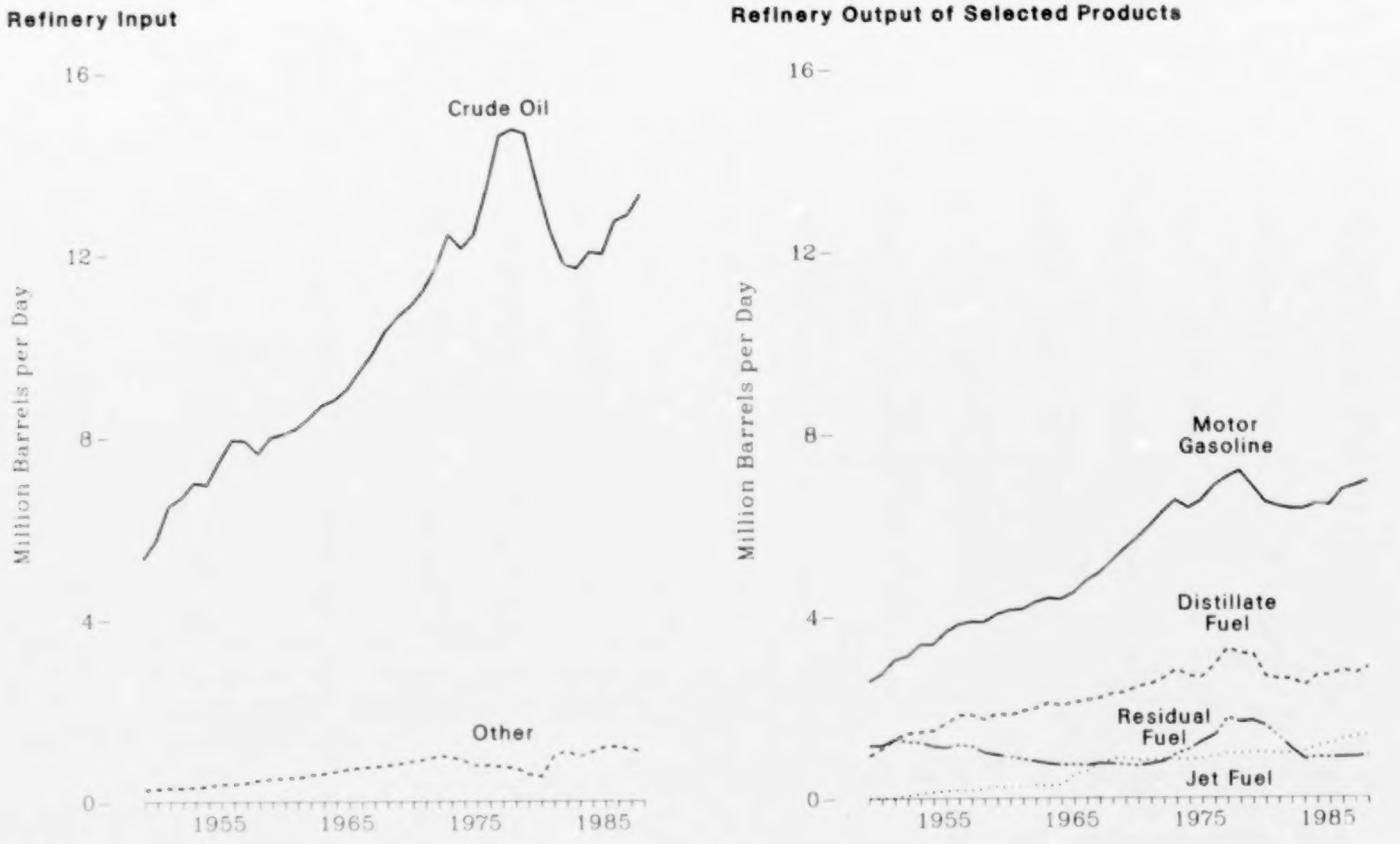
[P] Preliminary.

Note: Data include imports for the Strategic Petroleum Reserve which began in 1977.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1960 through 1975—Bureau of Mines, *Minerals Yearbook*, "Crude Petroleum and Petroleum Products" chapter. •1976 through 1980—Energy Information Administration, Energy Data Reports, *P.A.D. Districts Supply/Demand, Annual*. •1981 through 1987—Energy Information Administration, *Petroleum Supply Annual*. •1988—Energy Information Administration, *Petroleum Supply Monthly* December 1988 (February 1989).

Figure 55. Refinery Input and Output, 1949-1988



Source: See Table 55.

Table 55. Refinery Input and Output, 1949-1988

(Million Barrels per Day)

Year	Input				Output							Processing Gain or Loss
	Crude Oil	Natural Gas Plant Liquids	Other Liquids[1]	Total Input	Motor Gasoline[2]	Jet Fuel[2]	Distillate Fuel Oil	Residual Fuel Oil	Liquefied Petroleum Gases	Other Products[3]	Total Output	
1949	5.33	0.23	0.03	5.59	2.57	NA	0.93	1.16	0.06	0.85	5.59	(*)
1950	5.74	0.26	0.02	6.02	2.74	NA	1.09	1.16	0.08	0.95	6.02	(*)
1951	6.49	0.27	0.03	6.80	3.04	NA	1.30	1.29	0.09	1.09	6.80	0.01
1952	6.67	0.28	0.01	6.97	3.12	0.06	1.42	1.24	0.08	1.06	6.97	0.01
1953	7.00	0.30	(*)	7.31	3.38	0.10	1.45	1.23	0.09	1.08	7.33	0.02
1954	6.96	0.32	0.02	7.30	3.38	0.13	1.49	1.14	0.09	1.10	7.32	0.02
1955	7.48	0.34	0.03	7.86	3.65	0.16	1.65	1.15	0.12	1.17	7.89	0.03
1956	7.94	0.37	0.01	8.32	3.82	0.18	1.82	1.17	0.14	1.24	8.36	0.04
1957	7.92	0.41	(*)	8.33	3.88	0.17	1.83	1.14	0.15	1.20	8.37	0.04
1958	7.64	0.37	0.09	8.11	3.87	0.20	1.73	1.00	0.16	1.22	8.17	0.06
1959	7.99	0.42	0.07	8.48	4.04	0.25	1.86	0.95	0.19	1.28	8.57	0.09
1960	8.07	0.45	0.06	8.58	4.13	0.24	1.82	0.91	0.21	1.42	8.73	0.15
1961	8.18	0.46	0.06	8.71	4.15	0.26	1.91	0.86	0.22	1.49	8.89	0.18
1962	8.41	0.50	0.08	8.99	4.30	0.28	1.97	0.81	0.21	1.59	9.16	0.18
1963	8.69	0.52	0.09	9.30	4.39	0.27	2.09	0.76	0.26	1.72	9.50	0.20
1964	8.81	0.58	0.07	9.46	4.37	0.29	2.03	0.73	0.29	1.97	9.68	0.22
1965	9.04	0.62	0.09	9.75	4.51	0.52	2.10	0.74	0.29	1.81	9.97	0.22
1966	9.44	0.65	0.09	10.18	4.77	0.59	2.15	0.72	0.29	1.90	10.43	0.25
1967	9.82	0.67	0.09	10.58	4.94	0.75	2.20	0.76	0.31	1.92	10.87	0.29
1968	10.31	0.71	0.08	11.10	5.20	0.86	2.29	0.75	0.32	1.99	11.42	0.32
1969	10.63	0.72	0.11	11.46	5.47	0.88	2.32	0.73	0.34	2.06	11.79	0.34
1970	10.87	0.76	0.12	11.75	5.70	0.83	2.45	0.71	0.35	2.08	12.11	0.36
1971	11.20	0.78	0.14	12.12	5.97	0.83	2.50	0.75	0.36	2.09	12.50	0.38
1972	11.70	0.83	0.17	12.69	6.28	0.85	2.63	0.80	0.36	2.17	13.08	0.39
1973	12.43	0.82	0.15	13.40	6.53	0.86	2.82	0.97	0.37	2.30	13.85	0.45
1974	12.13	0.75	0.14	13.02	6.36	0.84	2.67	1.07	0.34	2.23	13.50	0.48
1975	12.44	0.71	0.07	13.23	6.52	0.87	2.65	1.24	0.31	2.10	13.68	0.46
1976	13.42	0.73	0.06	14.20	6.84	0.92	2.92	1.38	0.34	2.28	14.68	0.48
1977	14.60	0.67	0.07	15.35	7.03	0.97	3.28	1.75	0.35	2.49	15.87	0.52
1978	14.74	0.64	0.09	15.47	7.17	0.97	3.17	1.67	0.35	2.64	15.97	0.50
1979	14.65	0.51	0.08	15.24	6.84	1.01	3.15	1.69	0.34	2.74	15.76	0.53
1980	13.48	0.46	0.08	14.02	6.49	1.00	2.66	1.58	0.33	2.56	14.62	0.60
1981	12.47	0.52	0.49	13.48	6.40	0.97	2.61	1.32	0.31	2.37	13.99	0.51
1982	11.77	0.52	0.57	12.86	6.34	0.98	2.61	1.07	0.27	2.13	13.39	0.53
1983	11.69	0.46	0.50	12.65	6.34	1.02	2.46	0.85	0.33	2.14	13.14	0.49
1984	12.04	0.50	0.58	13.13	6.45	1.13	2.68	0.89	0.36	2.16	13.68	0.55
1985	12.00	0.51	0.68	13.19	6.42	1.19	2.69	0.88	0.39	2.18	13.75	0.56
1986	12.72	0.48	0.71	13.91	6.75	1.29	2.80	0.89	0.42	2.37	14.52	0.62
1987	12.85	0.47	0.67	13.99	6.84	1.34	2.73	0.89	0.45	2.38	14.63	0.64
1988[P]	13.30	0.46	0.62	14.38	6.95	1.37	2.86	0.93	0.49	2.43	15.04	0.66

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[1] Prior to 1981, includes unfinished oils (net), hydrogen, and hydrocarbons not included elsewhere. 1981 forward includes unfinished oils (net), motor gasoline blending components (net), aviation gasoline blending components (net), hydrogen, other hydrocarbons, and alcohol. See Appendix E, Note 5.

[2] Prior to 1964, motor gasoline data were for total gasoline, including motor gasoline, aviation gasoline, and special naphtha. Prior to 1965, kerosene-type jet fuel was included in kerosene.

[3] Includes kerosene, petrochemical feedstocks, lubricants, wax, petroleum coke, asphalt, road oil, still gas, and miscellaneous products. Since 1964, aviation gasoline and special naphthas are included.

[*] Less than 5,000 barrels per day.

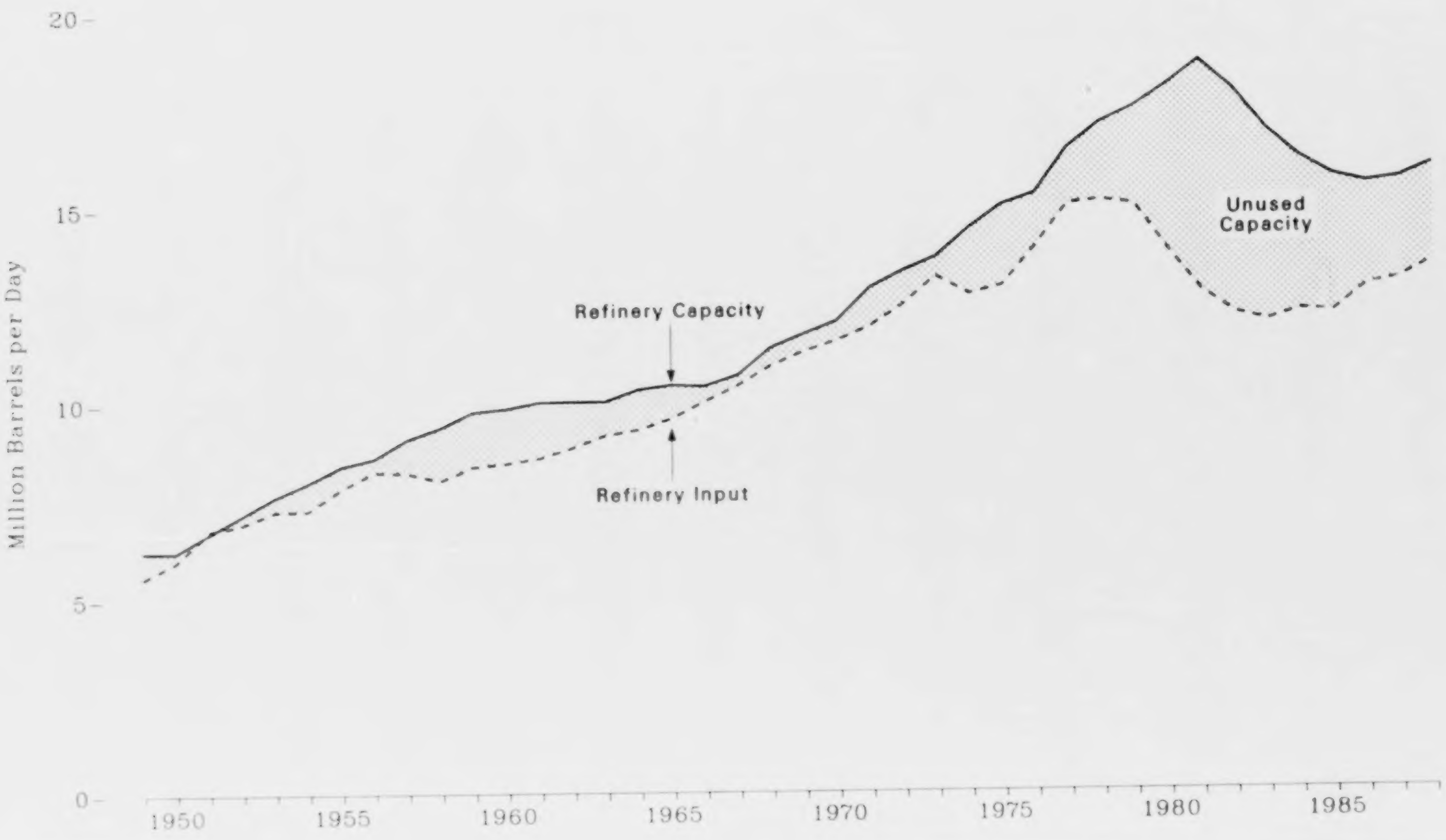
[P] Preliminary.

NA = Not available.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1949 through 1975—Bureau of Mines, Mineral Industry Surveys, *Petroleum Statement, Annual.* •1976 through 1980—Energy Information Administration, Energy Data Reports, *Petroleum Statement, Annual.* • 1981 through 1987—Energy Information Administration, *Petroleum Supply Annual.* •1988—Energy Information Administration, *Petroleum Supply Monthly* December 1988 (February 1989).

Figure 56. Refinery Capacity and Utilization, 1949–1988



Source: See Table 56.

Table 56. Refinery Capacity and Utilization, 1949-1988

Year	Operable Refineries: Number [1]	Operable Refineries: Capacity [2] (million barrels per day)	Gross Input to Distillation Units [3] (million barrels per day)	Utilization [4] (percent)
1949	336	6.23	5.56	89.2
1950	320	6.22	5.98	92.5
1951	325	6.70	6.76	97.5
1952	327	7.16	6.93	93.8
1953	315	7.62	7.26	93.1
1954	308	7.98	7.27	88.8
1955	296	8.39	7.82	92.2
1956	317	8.58	8.25	93.5
1957	317	9.07	8.22	89.2
1958	315	9.36	8.02	83.9
1959	313	9.76	8.36	85.2
1960	309	9.84	8.44	85.1
1961	309	10.00	8.57	85.7
1962	309	10.01	8.83	88.2
1963	304	10.01	9.14	90.0
1964	298	10.31	9.28	89.6
1965	293	10.42	9.56	91.8
1966	280	10.39	9.99	94.9
1967	276	10.66	10.39	94.4
1968	282	11.35	10.89	94.5
1969	279	11.70	11.25	94.8
1970	276	12.02	11.52	92.6
1971[3]	272	12.86	11.88	90.9
1972	274	13.29	12.43	92.3
1973	268	13.64	13.15	93.9
1974	273	14.36	12.69	86.6
1975	279	14.96	12.90	85.5
1976	276	15.24	13.88	87.8
1977	282	16.40	14.98	89.6
1978	296	17.05	15.07	87.4
1979	308	17.44	14.96	84.4
1980	319	17.99	13.80	75.4
1981	324	18.62	12.75	68.6
1982	301	17.89	12.17	69.9
1983	258	16.86	11.95	71.7
1984	247	16.14	12.22	76.2
1985	223	15.66	12.17	77.6
1986	216	15.46	12.83	82.9
1987	219	15.57	13.00	83.1
1988[5]	213	15.92	13.44	84.5

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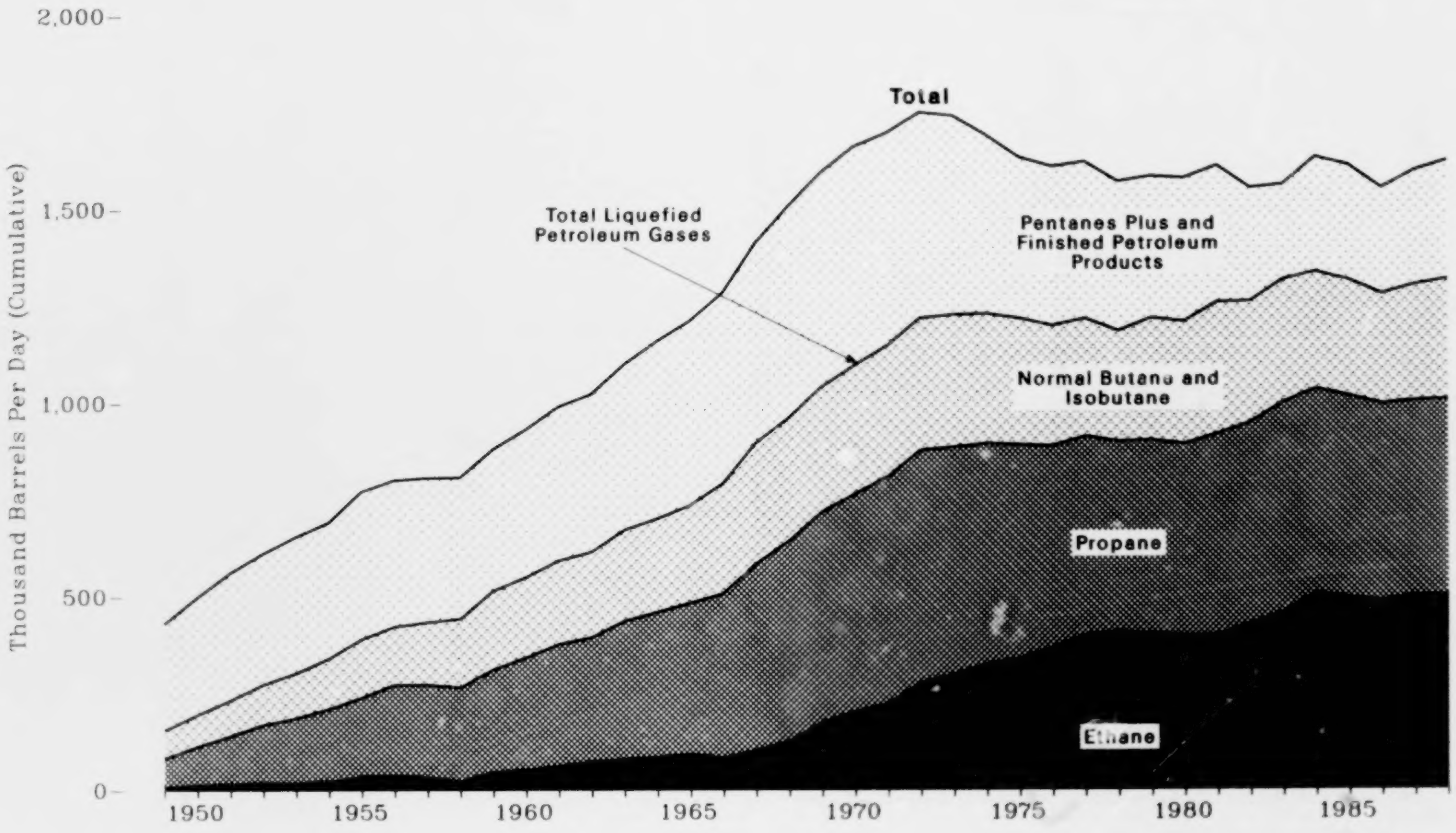
[1] Prior to 1956, the number of refineries includes only those in operation on January 1. For 1957 and forward, the number of refineries includes all operable refineries on January 1 (see Glossary). [2] Capacity in million barrels per calendar day on January 1. [3] See Appendix E, Note 6. [4] For 1949 through 1980, utilization is derived by dividing gross input to distillation units by one-half of the current year January 1 capacity and the following year January 1 capacity. Percentages were derived from unrounded numbers. For 1981 and forward, utilization is derived by averaging reported monthly utilization. [5] Preliminary. Note: Data are for refineries in the United States, excluding the Hawaiian Foreign Trade Zone. Sources: **Operable Refineries:** •1949 through 1977—Bureau of Mines, Mineral Industry Surveys, *Petroleum Refineries, Annual*. •1978 through 1981—Energy Information Administration, Energy Data Reports, *Petroleum Refineries in the United States and U.S. Territories*. • 1982 and forward—Energy Information Administration, *Petroleum Supply Annual*. **Gross Input to Distillation Units:** •1949 through 1966—Bureau of Mines, *Minerals Yearbook*, "Natural Gas Liquids" and "Crude Petroleum and Petroleum Products" chapters. •1967 through 1977—Bureau of Mines, Mineral Industry Surveys, *Petroleum Refineries, Annual*. •1978 through 1980—Energy Information Administration, Energy Data Reports, *Petroleum Refineries in the United States and U.S. Territories*. •1981 through 1987—Energy Information Administration, *Petroleum Supply Annual*. •1988—Energy Information Administration, *Petroleum Supply Monthly*. **Utilization:** •1949 through 1980—calculated. •1981 through 1987—Energy Information Administration, *Petroleum Supply Annual*. •1988—Energy Information Administration, *Petroleum Supply Monthly* December 1988 (February 1989).

Figure 57. Natural Gas Plant Liquids Production, 1949-1988



Source: See Table 57.

Table 57. Natural Gas Plant Liquids Production, 1949-1988

(Thousand Barrels per Day)

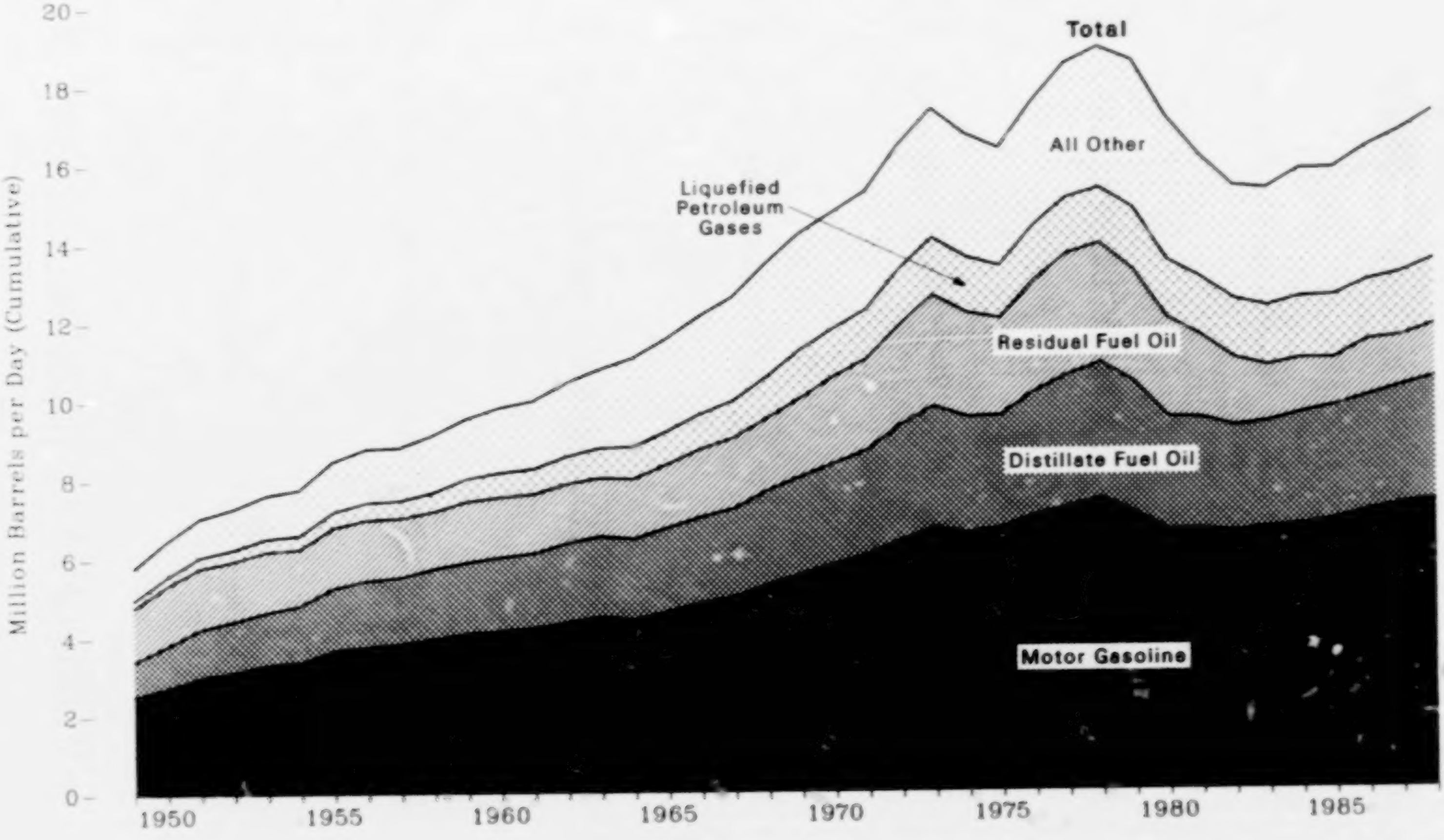
	Liquefied Petroleum Gases							
Year	Ethane [1]	Propane [1] [2]	Normal Butane [2]	Isobutane	Total	Pentanes Plus [3]	Finished Petroleum Products [4]	Total
1949	8	74	61	11	155	223	53	430
1950	12	101	69	13	195	238	66	499
1951	15	125	77	15	232	256	73	561
1952	19	150	86	18	273	269	70	611
1953	17	169	97	19	301	282	71	654
1954	22	188	106	24	339	290	61	691
1955	34	205	120	30	390	313	68	771
1956	37	235	123	27	422	310	68	800
1957	33	239	132	30	434	311	63	808
1958	23	242	141	36	442	307	58	808
1959	46	265	159	43	514	312	54	879
1960	51	291	161	45	549	333	47	929
1961	61	315	164	53	593	355	43	991
1962	73	321	165	55	614	367	41	1,021
1963	78	358	175	61	672	380	47	1,098
1964	84	375	178	62	699	408	48	1,154
1965	92	390	185	67	734	434	41	1,210
1966	82	424	214	73	792	456	37	1,284
1967	101	482	232	80	895	486	29	1,409
1968	125	517	236	81	960	509	35	1,504
1969	173	543	248	74	1,037	526	27	1,590
1970	201	561	248	84	1,095	540	25	1,660
1971	221	586	249	88	1,144	523	25	1,693
1972	275	600	249	92	1,215	507	21	1,744
1973	296	587	249	92	1,225	497	16	1,738
1974	323	569	244	92	1,227	454	7	1,688
1975	337	552	237	90	1,217	409	7	1,633
1976	365	521	227	82	1,195	403	6	1,604
1977	397	513	223	81	1,214	399	5	1,618
1978	406	491	210	75	1,182	382	3	1,567
1979	400	500	212	104	1,216	342	26	1,584
1980	396	494	210	105	1,205	345	23	1,573
1981	397	519	224	117	1,256	334	18	1,609
1982	426	519	204	109	1,258	282	11	1,550
1983	456	541	217	100	1,314	233	12	1,559
1984	505	527	203	99	1,334	292	4	1,630
1985	493	521	171	127	1,313	282	14	1,609
1986	485	508	157	128	1,277	269	4	1,551
1987	499	503	157	141	1,300	291	4	1,595
1988[5]	499	505	167	143	1,315	302	4	1,621

[1] Reported production of ethane-propane mixtures have been allocated 70 percent ethane and 30 percent propane.
[2] Reported production of butane-propane mixtures have been allocated 60 percent butane and 40 percent propane.
[3] Prior to 1984, this category was reported separately as natural gasoline, isopentane, and plant condensate.
[4] Includes motor gasoline, aviation gasoline, special naphthas, distillate fuel oil, and miscellaneous products.
[5] Preliminary.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1949 through 1968—Bureau of Mines, *Minerals Yearbook*, "Crude Petroleum and Petroleum Products" chapter. •1969 through 1975—Bureau of Mines, Mineral Industry Surveys, *Petroleum Statement, Annual*. •1976 through 1980—Energy Information Administration, Energy Data Reports, *Petroleum Statement, Annual*. •1981 through 1987—Energy Information Administration, *Petroleum Supply Annual*. •1988—Energy Information Administration, *Petroleum Supply Monthly* December 1988 (February 1989).

Figure 58. Petroleum Products Supplied by Type, 1949-1988



Source: See Table 58.

Table 58. Petroleum Products Supplied [1] by Type, 1949-1988

(Million Barrels per Day)

Year	Motor Gasoline [2]	Jet Fuel	Distillate Fuel Oil	Residual Fuel Oil	Liquefied Petroleum Gases	Other Products [3]	Total Products	Percentage Change from Previous Year [4]
1949	2.50	NA	0.90	1.36	0.19	0.81	5.76	—
1950	2.72	NA	1.08	1.52	0.23	0.90	6.46	12.1
1951	2.99	NA	1.23	1.55	0.28	0.98	7.02	8.6
1952	3.12	0.05	1.30	1.52	0.30	0.98	7.27	3.9
1953	3.30	0.09	1.34	1.54	0.33	1.00	7.60	4.3
1954	3.37	0.13	1.44	1.43	0.35	1.03	7.76	2.1
1955	3.66	0.15	1.59	1.53	0.40	1.12	8.46	9.0
1956	3.75	0.20	1.68	1.54	0.44	1.16	8.78	4.1
1957	3.82	0.20	1.69	1.50	0.45	1.15	8.81	0.1
1958	3.93	0.26	1.79	1.45	0.49	1.19	9.12	3.5
1959	4.07	0.29	1.81	1.54	0.58	1.24	9.53	4.5
1960	4.13	0.28	1.87	1.53	0.62	1.36	9.80	3.1
1961	4.20	0.29	1.90	1.50	0.64	1.44	9.98	1.5
1962	4.34	0.31	2.01	1.50	0.70	1.55	10.40	4.2
1963	4.47	0.32	2.05	1.48	0.76	1.68	10.74	3.3
1964	4.40	0.32	2.05	1.52	0.81	1.92	11.02	2.9
1965	4.59	0.60	2.13	1.61	0.84	1.74	11.51	4.2
1966	4.81	0.67	2.18	1.72	0.89	1.82	12.08	5.0
1967	4.96	0.82	2.24	1.79	0.94	1.81	12.56	3.9
1968	5.26	0.95	2.39	1.83	1.05	1.91	13.39	6.9
1969	5.53	0.99	2.47	1.98	1.22	1.95	14.14	5.3
1970	5.78	0.97	2.54	2.20	1.22	1.98	14.70	4.0
1971	6.01	1.01	2.66	2.30	1.25	1.98	15.21	3.5
1972	6.38	1.05	2.91	2.53	1.42	2.08	16.37	7.9
1973	6.67	1.06	3.09	2.82	1.45	2.21	17.31	5.5
1974	6.54	0.99	2.95	2.64	1.41	2.13	16.65	- 3.8
1975	6.67	1.00	2.85	2.46	1.33	2.00	16.32	- 2.0
1976	6.98	0.99	3.13	2.80	1.40	2.16	17.46	7.3
1977	7.18	1.04	3.35	3.07	1.42	2.37	18.43	5.3
1978	7.41	1.06	3.43	3.02	1.41	2.51	18.85	2.3
1979	7.03	1.08	3.31	2.83	1.59	2.67	18.51	- 1.8
1980	6.58	1.07	2.87	2.51	1.47	2.57	17.06	- 7.6
1981	6.59	1.01	2.83	2.09	1.47	2.08	16.06	- 6.1
1982	6.54	1.01	2.67	1.72	1.50	1.86	15.30	- 4.7
1983	6.62	1.05	2.69	1.42	1.51	1.94	15.23	- 0.4
1984	6.69	1.18	2.84	1.37	1.57	2.07	15.73	3.5
1985	6.83	1.22	2.87	1.20	1.60	2.01	15.73	- 0.3
1986	7.03	1.31	2.91	1.42	1.51	2.09	16.28	3.5
1987	7.21	1.38	2.98	1.26	1.61	2.22	16.67	2.4
1988[5]	7.31	1.45	3.10	1.33	1.67	2.31	17.17	3.3

[1] See Appendix E, Notes 5, 7, and 8.

[2] Prior to 1964, motor gasoline data were for total gasoline, including motor gasoline, aviation gasoline, and special naphtha.

[3] Includes kerosene, petrochemical feedstocks, lubricants, wax, petroleum coke, asphalt, road oil, still gas, pentanes plus, and miscellaneous products. Since 1964, aviation gasoline and special naphthas are included. Prior to 1965, kerosene-type jet fuel was included in kerosene. For 1981 and forward, other products include negative barrels per day of distillate and residual fuel oil reclassified as unfinished oils and other products (from both primary and secondary supply) reclassified as gasoline blending components. Beginning in 1983, product supplied also includes crude oil burned as fuel.

[4] Percent change from previous year calculated from data prior to rounding.

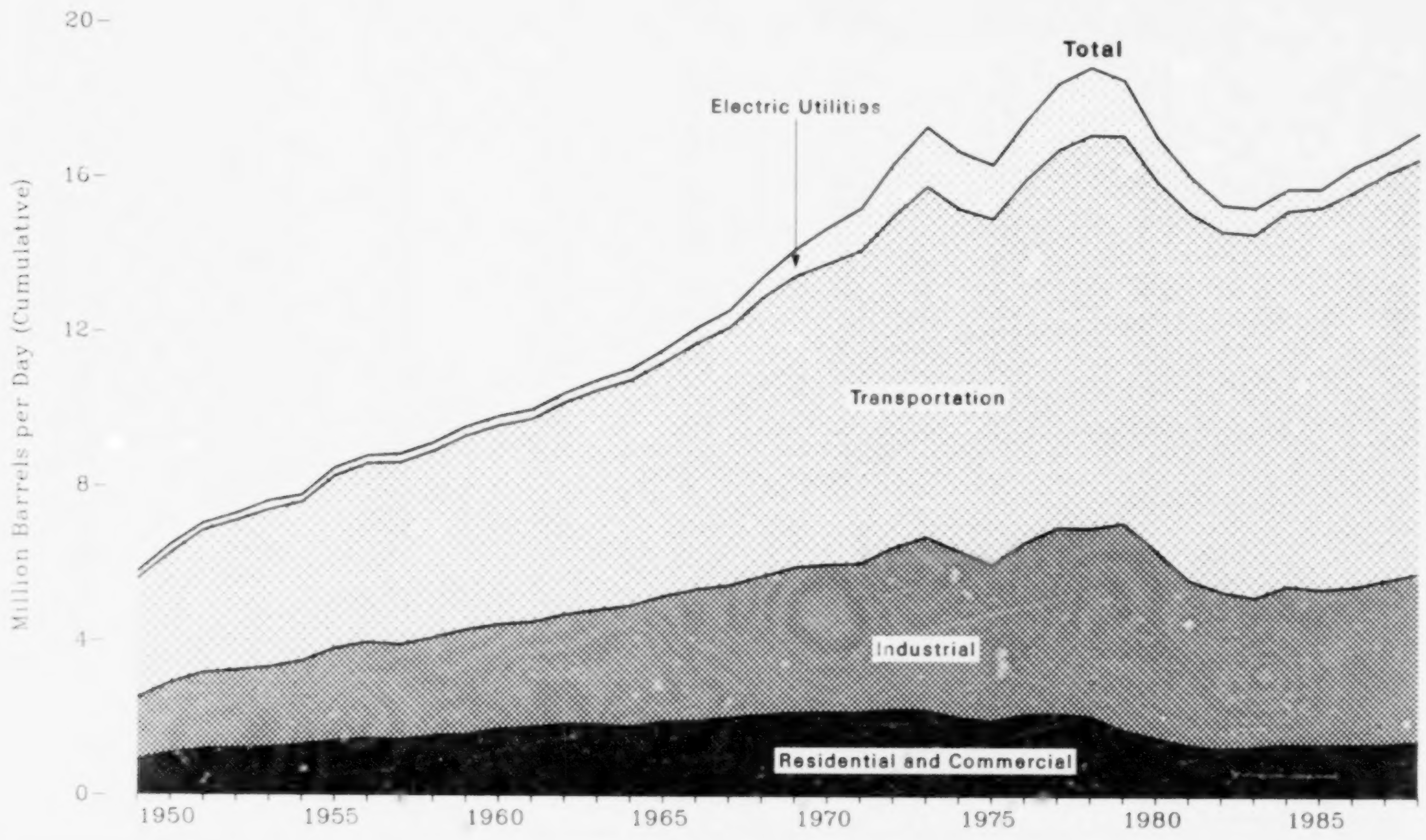
[5] Preliminary.

NA = Not available.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1949 through 1975—Bureau of Mines, Mineral Industry Surveys, *Petroleum Statement, Annual*. •1976 through 1980—Energy Information Administration, Energy Data Reports, *Petroleum Statement, Annual*. •1981 through 1987—Energy Information Administration, *Petroleum Supply Annual*. •1988—Energy Information Administration, *Petroleum Supply Monthly* December 1988 (February 1989).

Figure 59. Petroleum Products Supplied to End-Use Sectors, 1949-1988



Source: See Table 59.

Table 59. Petroleum Products Supplied [1] to End-Use Sectors, 1949-1988

(Million Barrels per Day)

Year	Residential and Commercial	Industrial	Transportation	Electric Utilities	Total
1949	0.90	1.60	3.08	0.18	5.76
1950	1.07	1.82	3.36	0.21	6.46
1951	1.17	1.98	3.69	0.18	7.02
1952	1.20	2.02	3.87	0.18	7.27
1953	1.22	2.08	4.07	0.23	7.60
1954	1.30	2.16	4.11	0.18	7.76
1955	1.40	2.39	4.46	0.21	8.46
1956	1.46	2.49	4.62	0.20	8.78
1957	1.43	2.46	4.71	0.22	8.81
1958	1.53	2.54	4.83	0.21	9.12
1959	1.57	2.71	5.01	0.24	9.53
1960	1.71	2.71	5.14	0.24	9.80
1961	1.76	2.72	5.25	0.24	9.98
1962	1.84	2.84	5.48	0.24	10.40
1963	1.84	2.96	5.68	0.26	10.74
1964	1.79	3.12	5.83	0.28	11.02
1965	1.91	3.25	6.04	0.32	11.51
1966	1.94	3.40	6.36	0.39	12.08
1967	2.02	3.43	6.66	0.44	12.56
1968	2.10	3.58	7.20	0.52	13.39
1969	2.16	3.76	7.52	0.69	14.14
1970	2.18	3.81	7.78	0.93	14.70
1971	2.18	3.84	8.09	1.09	15.21
1972	2.25	4.19	8.57	1.36	16.37
1973	2.23	4.48	9.05	1.54	17.31
1974	2.04	4.30	8.84	1.48	16.65
1975	1.95	4.04	8.95	1.39	16.32
1976	2.12	4.45	9.37	1.52	17.46
1977	2.14	4.82	9.76	1.71	18.43
1978	2.07	4.87	10.16	1.75	18.85
1979	1.73	5.34	10.01	1.44	18.51
1980	1.52	4.84	9.55	1.15	17.06
1981	1.33	4.27	9.49	0.96	16.06
1982	1.24	4.06	9.31	0.69	15.30
1983	1.29	3.86	9.40	0.68	15.23
1984	1.34	4.11	9.71	0.56	15.73
1985	1.35	4.02	9.87	0.48	15.73
1986	1.35	4.08	10.22	0.64	16.28
1987	1.37	4.24	10.51	0.55	16.67
1988[2]	1.41	4.37	10.71	0.68	17.17

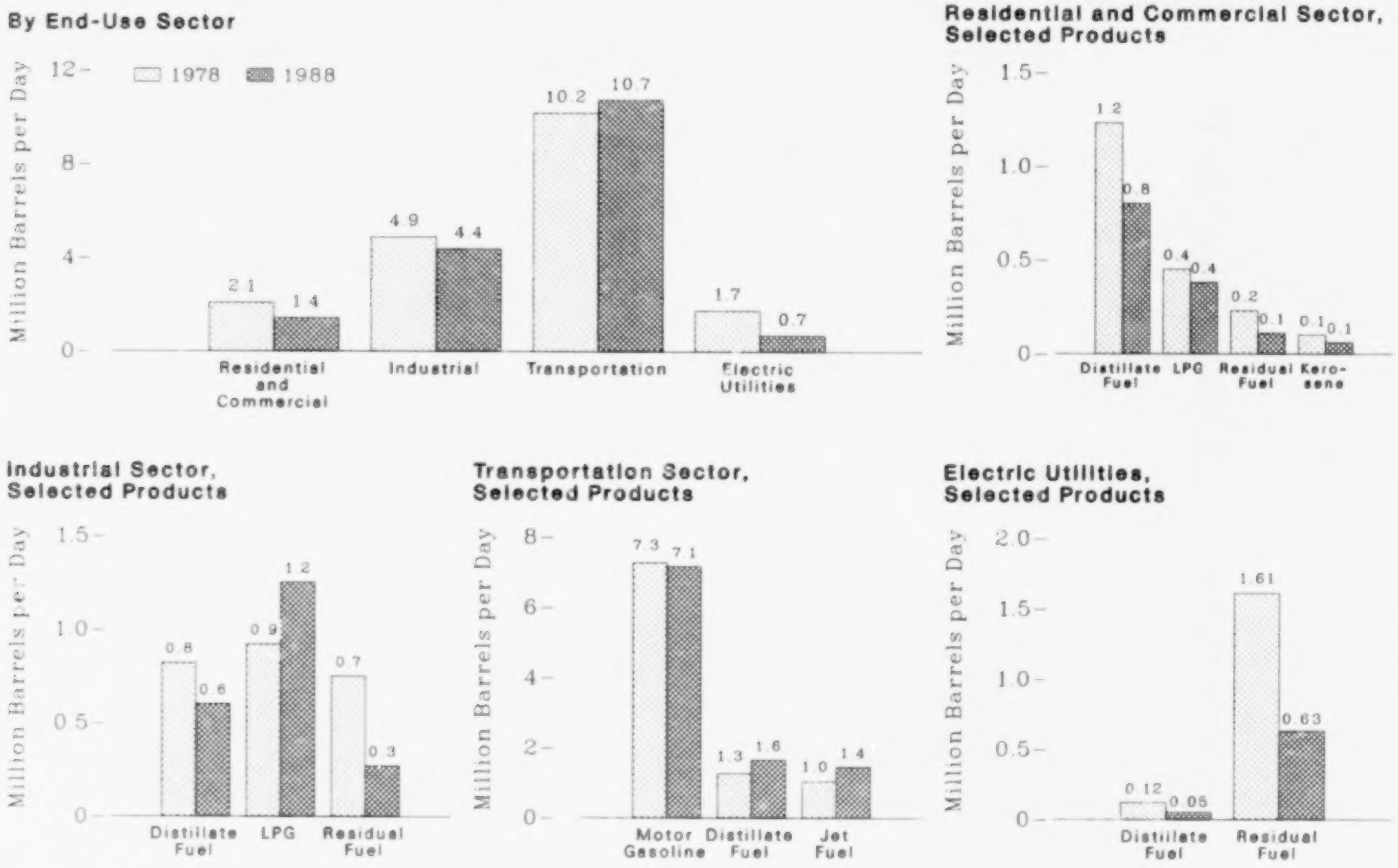
[1] See Appendix E, Note 7.

[2] Estimated.

Note: Sum of components may not equal total due to independent rounding.

Sources: **Total:** •1949 through 1975—Bureau of Mines, Mineral Industry Surveys, *Petroleum Statement, Annual.* •1976 through 1980—Energy Information Administration, Energy Data Reports, *Petroleum Statement, Annual* •1981 through 1987—Energy Information Administration, *Petroleum Supply Annual.* •1988—Energy Information Administration, *Petroleum Supply Monthly* and *Weekly Petroleum Status Report.* **Other Data:** •1949 through 1959—Energy Information Administration estimates. •1960 through 1987—Energy Information Administration, "State Energy Data System 1987." •1988—Energy Information Administration estimates.

Figure 60. Petroleum Products Supplied by Type and End-Use Sector, 1978 and 1988



Source: See Table 60.

Table 60. Petroleum Products Supplied [1] by Type and End-Use Sector, 1978 and 1988

Year and Refined Product	Residential and Commercial		Industrial		Transportation		Electric Utilities		Total	
	Million Barrels per Day	Quadrillion Btu	Million Barrels per Day	Quadrillion Btu	Million Barrels per Day	Quadrillion Btu	Million Barrels per Day	Quadrillion Btu	Million Barrels per Day	Quadrillion Btu
1978										
Asphalt and Road Oil	0	0	0.48	1.16	0	0	0	0	0.48	1.16
Aviation Gasoline	0	0	0	0	0.04	0.07	0	0	0.04	0.07
Distillate Fuel Oil	1.23	2.62	0.82	1.75	1.26	2.68	0.12	0.25	3.43	7.30
Jet Fuel	0	0	0	0	1.04	2.14	0.01	0.03	1.06	2.16
Kerosene	0.10	0.21	0.08	0.16	0	0	0	0	0.18	0.36
Liquefied Petroleum Gases	0.45	0.61	0.92	1.23	0.04	0.05	0	0	1.41	1.89
Lubricants	0	0	0.09	0.20	0.08	0.18	0	0	0.17	0.38
Motor Gasoline	0.06	0.11	0.09	0.18	7.26	13.93	0	0	7.41	14.21
Residual Fuel Oil	0.23	0.53	0.75	1.72	0.43	0.99	1.61	3.70	3.02	6.94
All Other [2]	0	0	1.64	3.48	0	0	0.01	0.01	1.65	3.49
Total	2.07	4.07	4.87	9.86	10.16	20.04	1.75	3.99	18.85	37.96
1988 [4]										
Asphalt and Road Oil	0	0	0.47	1.13	0	0	0	0	0.47	1.13
Aviation Gasoline	0	0	0	0	0.03	0.05	0	0	0.03	0.05
Distillate Fuel Oil	0.80	1.70	0.60	1.28	1.65	3.53	0.05	0.11	3.10	6.62
Jet Fuel	0	0	0	0	1.45	2.98	0	0	1.45	2.98
Kerosene	0.06	0.13	0.03	0.07	0	0	0	0	0.10	0.20
Liquefied Petroleum Gases	0.38	0.51	1.25	1.67	0.03	0.04	0	0	1.67	2.23
Lubricants	0	0	0.08	0.18	0.08	0.17	0	0	0.16	0.35
Motor Gasoline	0.06	0.11	0.11	0.21	7.15	13.74	0	0	7.31	14.06
Residual Fuel Oil	0.11	0.25	0.27	0.62	0.33	0.75	0.63	1.44	1.33	3.06
All Other [2]	0	0	1.56	3.28	0	0	0.01	0.01	1.57	3.29
Total	1.41	2.70	4.37	8.44	10.71	21.25	0.68	1.56	17.17	33.96

[1] See Appendix E, Notes 5, 7, and 8.

[2] Includes petrochemical feedstock, special naphthas, wax, petroleum coke, still gas, natural gasoline, pentanes plus, crude oil, and miscellaneous products.

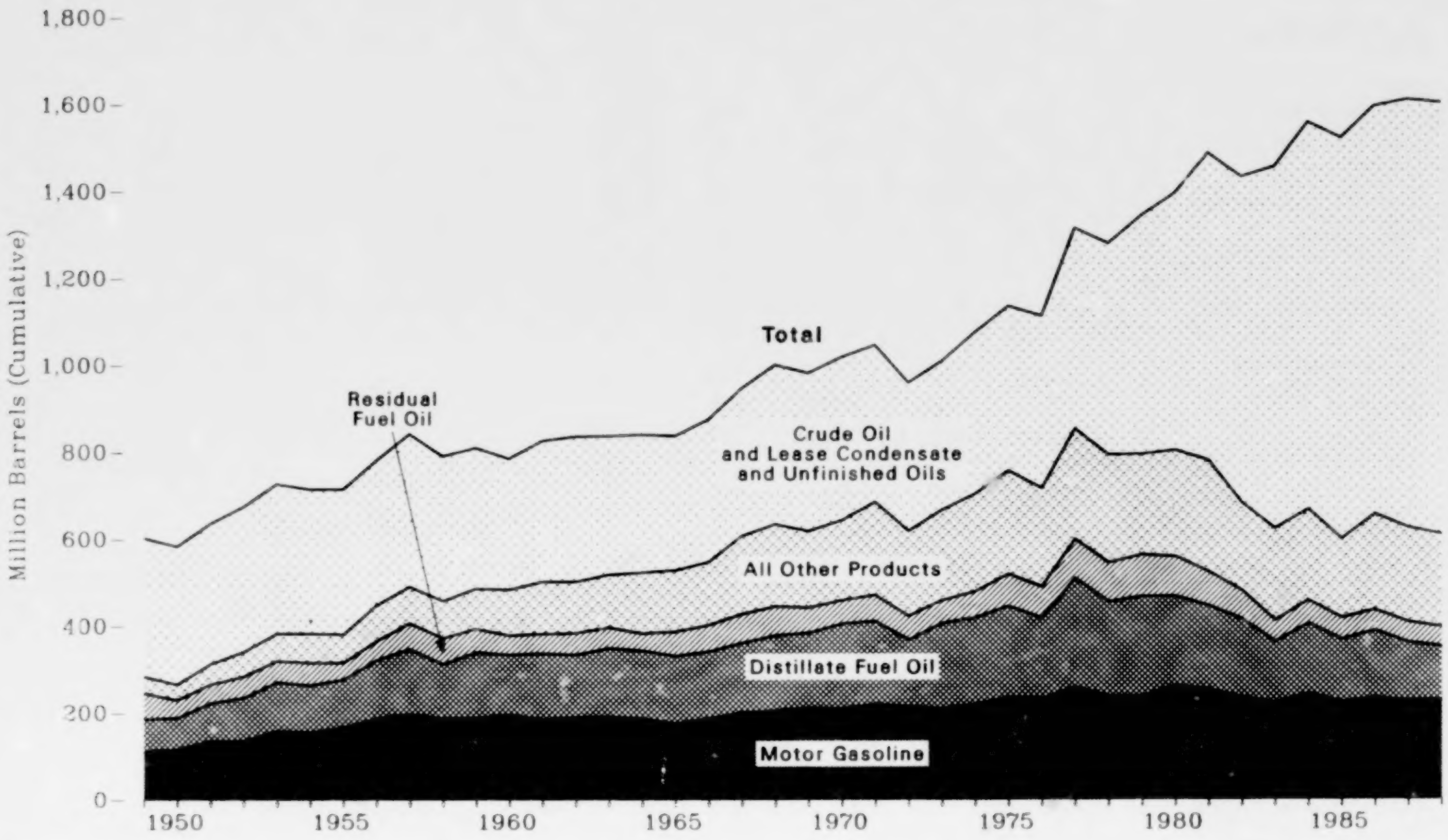
[3] Less than 5 thousand barrels per day.

[4] Estimated.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1978—Energy Information Administration, "State Energy Data System 1987." •1988—Energy Information Administration estimates.

Figure 61. Petroleum Primary Stocks by Type, End of Year 1949-1988



Source: See Table 61.

Table 61. Petroleum Primary Stocks by Type, End of Year 1949-1988

(Million Barrels)

Year	Crude Oil and Lease Condensate [1]	Petroleum Products								Total Petroleum
		Motor Gasoline [2]	Jet Fuel	Distillate Fuel Oil	Residual Fuel Oil	Liquefied Petroleum Gases	Unfinished Oils	Other Products [3]	Total Products	
1949	253	110	NA	75	60	1	66	37	350	603
1950	248	116	NA	72	41	2	70	34	334	583
1951	256	135	NA	87	43	2	67	45	378	634
1952	272	135	2	99	49	3	62	53	402	674
1953	274	158	3	112	49	4	69	56	451	726
1954	258	155	3	108	52	7	74	57	457	715
1955	266	165	3	111	39	7	68	55	449	715
1956	266	187	5	134	44	14	67	63	514	780
1957	282	197	5	149	60	14	69	66	560	841
1958	263	187	6	125	60	16	70	63	526	789
1959	257	188	8	151	54	19	67	66	552	809
1960	240	195	7	138	45	23	62	76	545	785
1961	245	184	8	152	45	31	79	81	580	825
1962	252	189	10	144	50	25	82	83	582	834
1963	237	191	9	157	48	28	82	85	598	836
1964	230	186	19	156	40	30	87	92	609	839
1965	220	175	19	155	56	30	89	92	616	836
1966	238	186	19	154	61	35	89	91	636	874
1967	249	200	22	160	66	64	90	93	695	944
1968	272	204	24	173	67	76	93	89	727	1,000
1969	265	211	28	172	58	60	98	88	715	980
1970	276	209	28	195	54	67	99	89	741	1,018
1971	260	219	28	191	60	95	101	92	784	1,044
1972	246	213	25	154	55	86	95	84	713	959
1973	242	209	29	196	53	99	99	80	766	1,008
1974	265	218	29	200	60	113	106	82	809	1,074
1975	271	235	30	209	74	125	106	82	862	1,133
1976	285	231	32	186	72	116	110	78	826	1,112
1977	348	258	35	250	90	136	113	82	964	1,312
1978	376	238	34	216	90	132	109	82	901	1,278
1979	430	237	39	229	96	111	118	82	911	1,341
1980	466	261	42	205	92	120	124	82	926	1,392
1981	594	253	41	192	78	135	111	80	890	1,484
1982	644	235	37	179	66	94	105	70	786	1,430
1983	723	222	39	140	49	101	108	72	731	1,454
1984	796	243	42	161	53	101	94	67	760	1,556
1985	814	223	40	144	50	74	107	67	705	1,519
1986	843	233	50	155	47	103	94	68	750	1,593
1987	890	226	50	134	47	97	93	70	718	1,607
1988[4]	891	228	44	123	45	99	100	70	709	1,600

[1] Includes crude oil stored in the Strategic Petroleum Reserve, which began in 1977.

[2] Prior to 1964, motor gasoline data were for total gasoline which included motor gasoline, aviation gasoline, and special naphthas. For 1981 and forward, includes motor gasoline blending components.

[3] Includes kerosene, petrochemical feedstocks, lubricants, wax, petroleum coke, asphalt, road oil, pentanes plus, and miscellaneous products. Since 1964, aviation gasoline and special naphthas are included. For 1981 and forward, includes aviation gasoline blending components, hydrogen, other hydrocarbons, and alcohol.

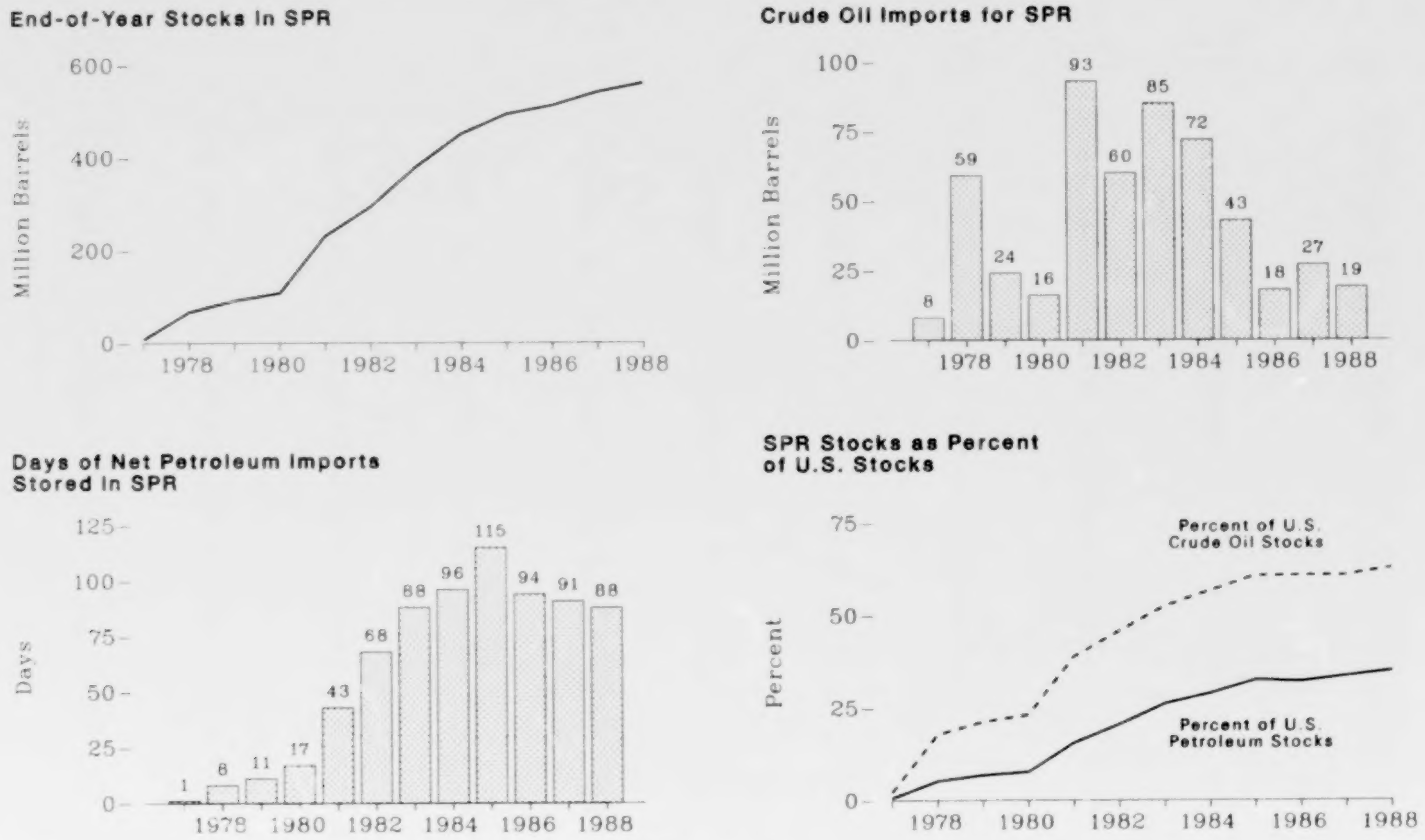
[4] Preliminary.

NA = Not available.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1949 through 1975—Bureau of Mines, Mineral Industry Surveys, *Petroleum Statement, Annual.* •1976 through 1980—Energy Information Administration, Energy Data Reports, *Petroleum Statement, Annual.* •1981 through 1987—Energy Information Administration, *Petroleum Supply Annual.* •1988—Energy Information Administration, *Petroleum Supply Monthly* December 1988 (February 1989).

Figure 62. Strategic Petroleum Reserve, 1977-1988


End-of-Year Stocks in SPR

Crude Oil Imports for SPR

Days of Net Petroleum Imports Stored in SPR

SPR Stocks as Percent of U.S. Stocks

Note: SPR = the Strategic Petroleum Reserve.
Source: See Table 62.

Table 62. Strategic Petroleum Reserve, 1977-1988

(Million Barrels, Except as Noted)

Year	Crude Oil Imports	Domestic Crude Oil Deliveries	End-of-Year Stocks			Days of Net Petroleum Imports [3]
			Quantity [1]	Percent of Crude Oil [2] Stocks	Percent of Total Petroleum Stocks	
1977	7.54	[4]0.37	7.46	2.1	0.6	1
1978	58.80	0	66.86	17.8	5.2	8
1979	24.43	(5)	91.19	21.2	6.8	11
1980	16.07	1.30	107.80	23.1	7.7	17
1981	93.30	28.79	230.34	38.8	15.5	43
1982	60.19	3.79	293.83	45.7	20.5	68
1983	85.29	0.42	379.09	52.4	26.1	88
1984	72.04	0.05	450.51	56.6	28.9	96
1985	43.12	0.17	493.32	60.6	32.5	115
1986	17.56	1.21	511.57	60.7	32.1	94
1987	26.52	2.69	540.65	60.8	33.6	91
1988	18.76	(5)	559.52	62.8	35.0	88

[1] Stocks do not include imported quantities in transit to Strategic Petroleum Reserve terminals, pipeline fill, and above-ground storage.

[2] Including lease condensate stocks.

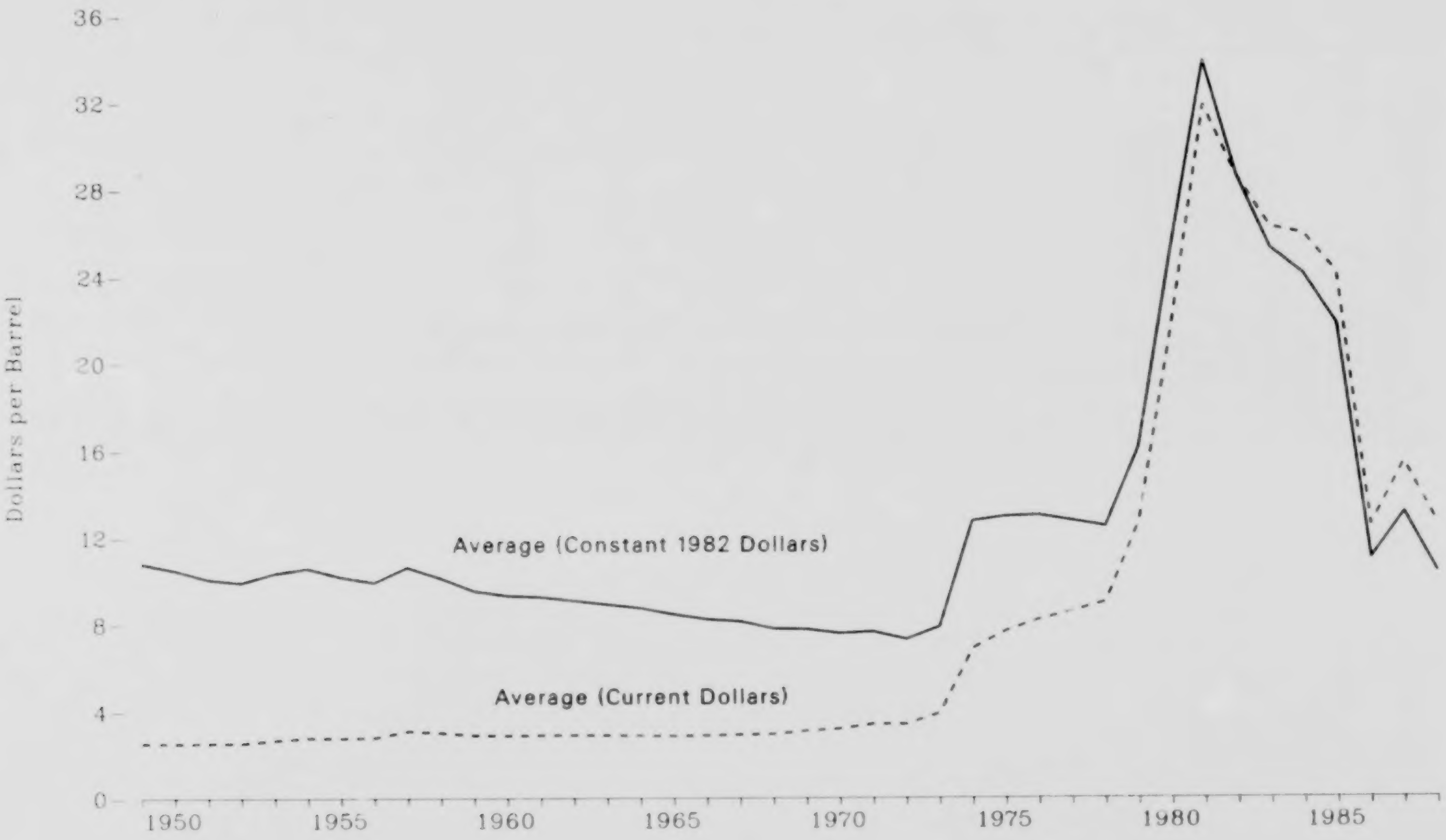
[3] Derived by dividing end-of-year strategic petroleum reserve stocks by annual average daily net imports of all petroleum. Calculated prior to rounding.

[4] The quantity of domestic fuel oil which was in storage prior to injection of foreign crude oil.

[5] Less than 0.005 million barrels.

Sources: **Domestic Crude Oil Deliveries:** Department of Energy, Assistant Secretary for Fossil Energy, unpublished data. **All Other Data:** •1977 through 1980—Energy Information Administration, Energy Data Report, *Petroleum Statement, Annual.* •1981 through 1987—Energy Information Administration, *Petroleum Supply Annual.* • 1988—Energy Information Administration, *Petroleum Supply Monthly* December 1988 (February 1989).

Figure 63. Crude Oil Domestic First Purchase Price, 1949-1988



Source: See Table 63.

Table 63. Crude Oil Domestic First Purchase Price,[1] 1949-1988

(Dollars per Barrel)

Year	Alaska North Slope (current)	Other U.S. (current)	U.S. Average	
			(current)	(constant)[2]
1949	—	2.54	2.54	10.81
1950	—	2.51	2.51	10.50
1951	—	2.53	2.53	10.08
1952	—	2.53	2.53	9.92
1953	—	2.68	2.68	10.35
1954	—	2.78	2.78	10.57
1955	—	2.77	2.77	10.18
1956	—	2.79	2.79	9.93
1957	—	3.09	3.09	10.62
1958	—	3.01	3.01	10.13
1959	—	2.90	2.90	9.54
1960	—	2.88	2.88	9.32
1961	—	2.89	2.89	9.26
1962	—	2.90	2.90	9.09
1963	—	2.89	2.89	8.92
1964	—	2.88	2.88	8.75
1965	—	2.86	2.86	8.46
1966	—	2.88	2.88	8.23
1967	—	2.92	2.92	8.13
1968	—	2.94	2.94	7.80
1969	—	3.09	3.09	7.76
1970	—	3.18	3.18	7.57
1971	—	3.39	3.39	7.64
1972	—	3.39	3.39	7.29
1973	—	3.89	3.89	7.86
1974	—	6.87	6.87	12.72
1975	—	7.67	7.67	12.93
1976	—	8.19	8.19	12.98
1977	[3] 6.32	[3] 8.63	8.57	12.73
1978	5.21	9.56	9.00	12.47
1979	10.57	13.01	12.64	16.08
1980	16.87	22.65	21.59	25.19
1981	23.23	33.71	31.77	33.80
1982	19.92	30.43	28.52	28.52
1983	17.69	28.00	26.19	25.21
1984	17.91	27.59	25.88	24.03
1985	16.98	25.74	24.09	21.72
1986	6.45	14.13	12.51	10.98
1987	10.83	16.83	15.40	13.08
1988[4]	8.43	13.97	12.57	10.33

[1] See Appendix E, Note 9.

[2] In 1982 dollars, calculated using implicit GNP price deflators. See Appendix C.

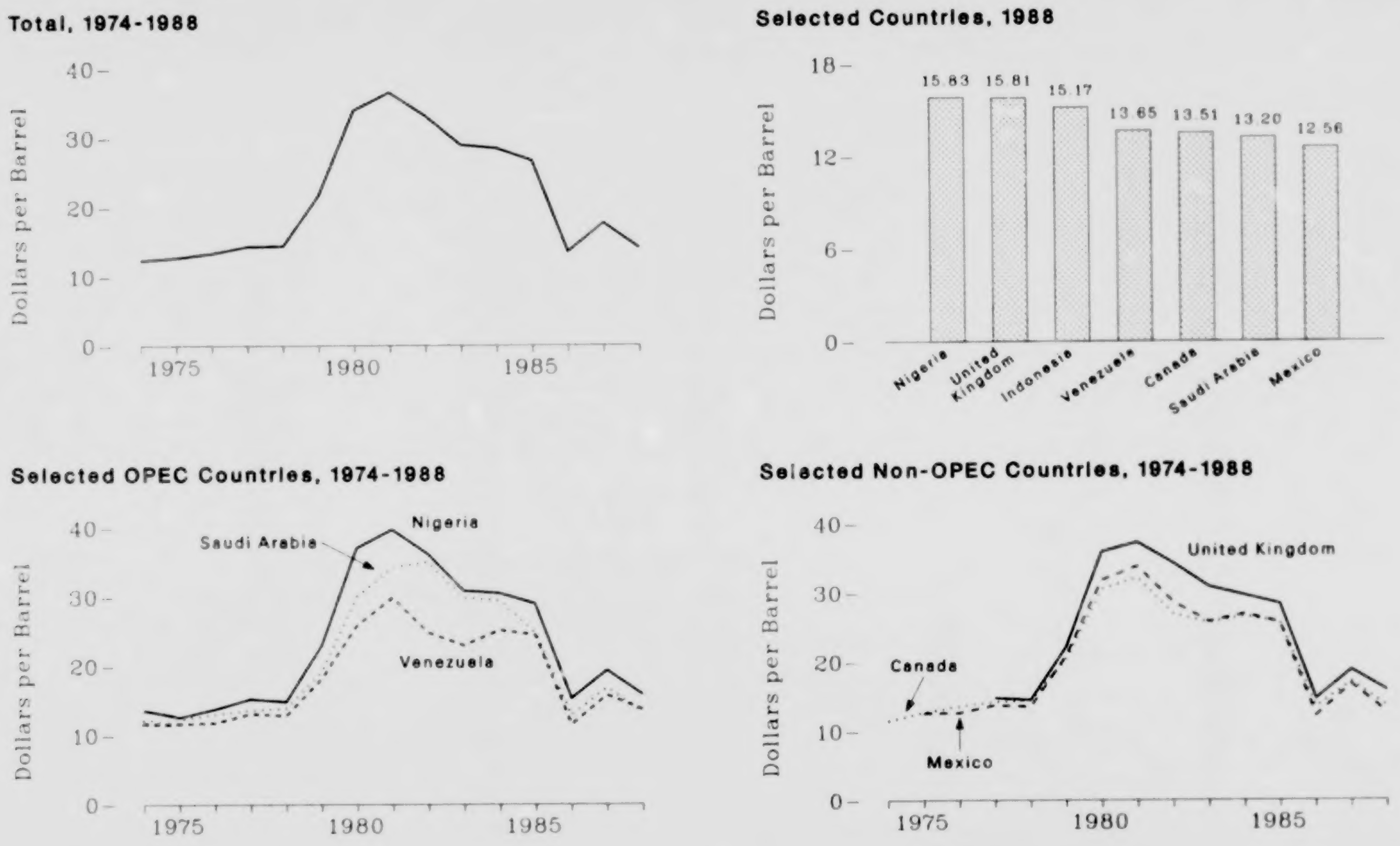
[3] Average for July through December only.

[4] Preliminary.

— = Not applicable.

Sources: •1949 through 1973—Bureau of Mines, *Minerals Yearbook*, "Crude Petroleum and Petroleum Products" chapter. •1974 through January 1976—Federal Energy Administration, FEA Form 90, "Crude Petroleum Production Monthly Report." • February 1976 through September 1979—Federal Energy Administration, Form FEA P-124, "Domestic Crude Oil Purchaser's Monthly Report." • October 1979 through 1982—Economic Regulatory Administration, Form 182, "Domestic Crude Oil First Purchase Report." • 1983 and forward—Energy Information Administration, Form 182, "Domestic Crude Oil First Purchase Report."

Figure 64. Landed Cost of Crude Oil Imports from Selected Countries



Total, 1974-1988

Selected Countries, 1988

Selected OPEC Countries, 1974-1988

Selected Non-OPEC Countries, 1974-1988

Source: See Table 64.

Table 64. Landed Cost of Crude Oil Imports from Selected Countries, 1974-1988

(Dollars per Barrel)

Year	Organization of Petroleum Exporting Countries (OPEC)[1]								Canada	Mexico	United Kingdom	Other Non-OPEC	Total
	Algeria	Indonesia	Nigeria	Saudi Arabia	Venezuela	Other OPEC[2]	Total OPEC[3]	Total Arab OPEC[4]					
1974	13.97	13.20	13.16	11.63	11.25	12.55	12.49	12.39	11.48	W	NA	12.68	12.32
1975	12.72	13.79	12.62	12.30	11.65	12.45	12.70	12.71	12.72	12.61	NA	12.61	12.70
1976	13.81	13.82	13.80	13.04	11.80	12.84	13.32	13.31	13.57	12.64	W	13.22	13.34
1977	15.20	14.63	15.25	13.61	13.13	13.84	14.35	14.30	14.21	13.75	14.83	14.33	14.31
1978	14.91	14.64	14.86	13.92	12.83	13.87	14.34	14.36	14.50	13.54	14.53	14.40	14.38
1979	21.90	20.69	22.96	19.15	18.18	24.09	21.29	20.79	20.43	20.86	22.16	23.14	21.65
1980	37.90	33.92	37.05	30.02	25.86	33.86	33.56	32.97	30.47	31.80	35.88	36.11	33.95
1981	40.49	37.57	39.70	34.19	29.87	34.74	36.60	36.22	32.16	33.78	37.24	38.54	36.52
1982	35.28	36.75	36.17	35.00	24.82	32.74	34.81	35.15	26.92	28.64	34.28	33.94	33.18
1983	31.26	31.57	30.84	29.76	22.94	29.33	29.87	30.03	25.63	25.78	30.87	29.69	28.93
1984	29.08	30.64	30.50	29.50	25.15	28.77	28.93	29.12	26.59	26.87	29.60	29.19	28.46
1985	27.46	28.67	28.96	24.72	24.43	26.45	26.85	25.88	25.71	25.63	28.35	27.15	26.66
1986	14.82	14.63	15.29	12.84	11.52	13.36	13.46	13.14	13.43	12.17	14.63	14.08	13.49
1987	17.87	18.49	19.32	16.81	15.76	18.20	17.64	17.32	17.04	16.69	18.78	18.30	17.65
1988[5]	W	15.17	15.82	13.23	13.65	14.14	14.13	13.52	13.50	12.57	15.79	14.43	14.04

[1] See Glossary for membership.

[2] "Other OPEC" consists of Ecuador, Gabon, Iran, Iraq, Kuwait, Libya, Qatar, and United Arab Emirates. Prior to 1988, imports from the Neutral Zone between Kuwait and Saudi Arabia are included in imports from Saudi Arabia. From 1988 forward, those imports are included in imports from "Other OPEC."

[3] "Total OPEC" consists of Ecuador, Gabon, Indonesia, Iran, Nigeria, and Venezuela, as well as the Arab members. "Total OPEC" imports exclude petroleum imported into the United States indirectly from OPEC countries, primarily from Caribbean and West European refining areas, as petroleum products that were refined from crude oil produced in OPEC countries.

[4] "Total Arab OPEC" consists of Algeria, Iraq, Kuwait, Libya, Qatar, Saudi Arabia, and United Arab Emirates. Imports from the Neutral Zone are included in imports from "Total Arab OPEC."

[5] Preliminary.

W = Value withheld to avoid disclosure of individual company data.

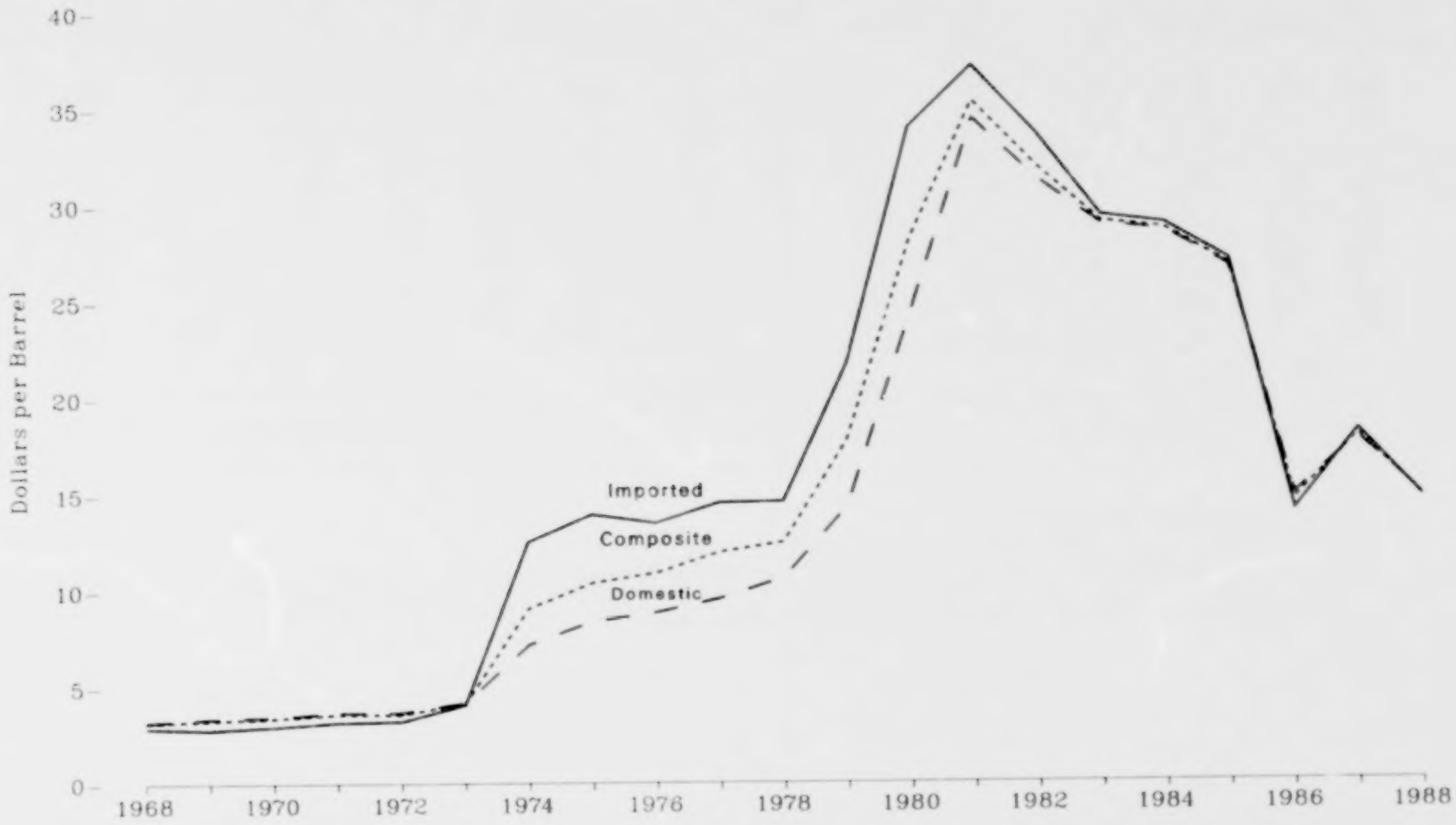
NA = Not available, included in "Other Non-Opec."

Note: Data include imports for the Strategic Petroleum Reserve, which began in 1977.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1974 through September 1977—Federal Energy Administration, Form FEA-F701-M-0, "Transfer Pricing Report." • October 1977 through January 1979—Energy Information Administration, Form FEA-F701-M-0, "Transfer Pricing Report." • February 1979 through September 1982—Energy Information Administration, Form ERA-51, "Transfer Pricing Report." • October 1982 through June 1984—Energy Information Administration, Form EP-51, "Foreign Crude Oil Transaction Report." • July 1984 and forward—Energy Information Administration, Form EIA-856, "Monthly Foreign Crude Oil Acquisition Report."

Figure 65. Crude Oil Refiner Acquisition Cost, 1968–1988



Source: See Table 65.

Table 65. Crude Oil Refiner Acquisition Cost,[1] 1968-1988

(Dollars per Barrel)

Year	Domestic[2]		Imported[2]		Composite[2]	
	Current	Constant[3]	Current	Constant[3]	Current	Constant[3]
1968	3.21	8.51	2.90	7.69	3.17	8.41
1969	3.37	8.47	2.80	7.04	3.29	8.27
1970	3.46	8.24	2.96	7.05	3.40	8.10
1971	3.68	8.29	3.17	7.14	3.60	8.11
1972	3.67	7.89	3.22	6.92	3.58	7.70
1973	4.17	8.42	4.08	8.24	4.15	8.38
1974	7.18	13.30	12.52	23.19	9.07	16.80
1975	8.39	14.15	13.93	23.49	10.38	17.50
1976	8.84	14.01	13.48	21.36	10.89	17.26
1977	9.55	14.19	14.53	21.59	11.96	17.77
1978	10.61	14.70	14.57	20.18	12.46	17.26
1979	14.27	18.16	21.67	27.57	17.72	22.54
1980	24.23	28.27	33.89	39.54	28.07	32.75
1981	34.33	36.52	37.05	39.41	35.24	37.49
1982	31.22	31.22	33.55	33.55	31.87	31.87
1983	28.87	27.79	29.30	28.20	28.99	27.90
1984	28.53	26.49	28.88	26.82	28.63	26.58
1985	26.66	24.04	26.99	24.34	26.75	24.12
1986	14.82	13.01	14.00	12.29	14.55	12.77
1987	17.76	15.09	18.13	15.40	17.90	15.21
1988[4]	14.76	12.13	14.64	12.03	14.71	12.09

[1] Refiner acquisition cost of crude oil for each category and for the composite is derived by dividing the sum of the total purchasing (acquisition) costs of all refiners by the total volume of all refiners' purchases.

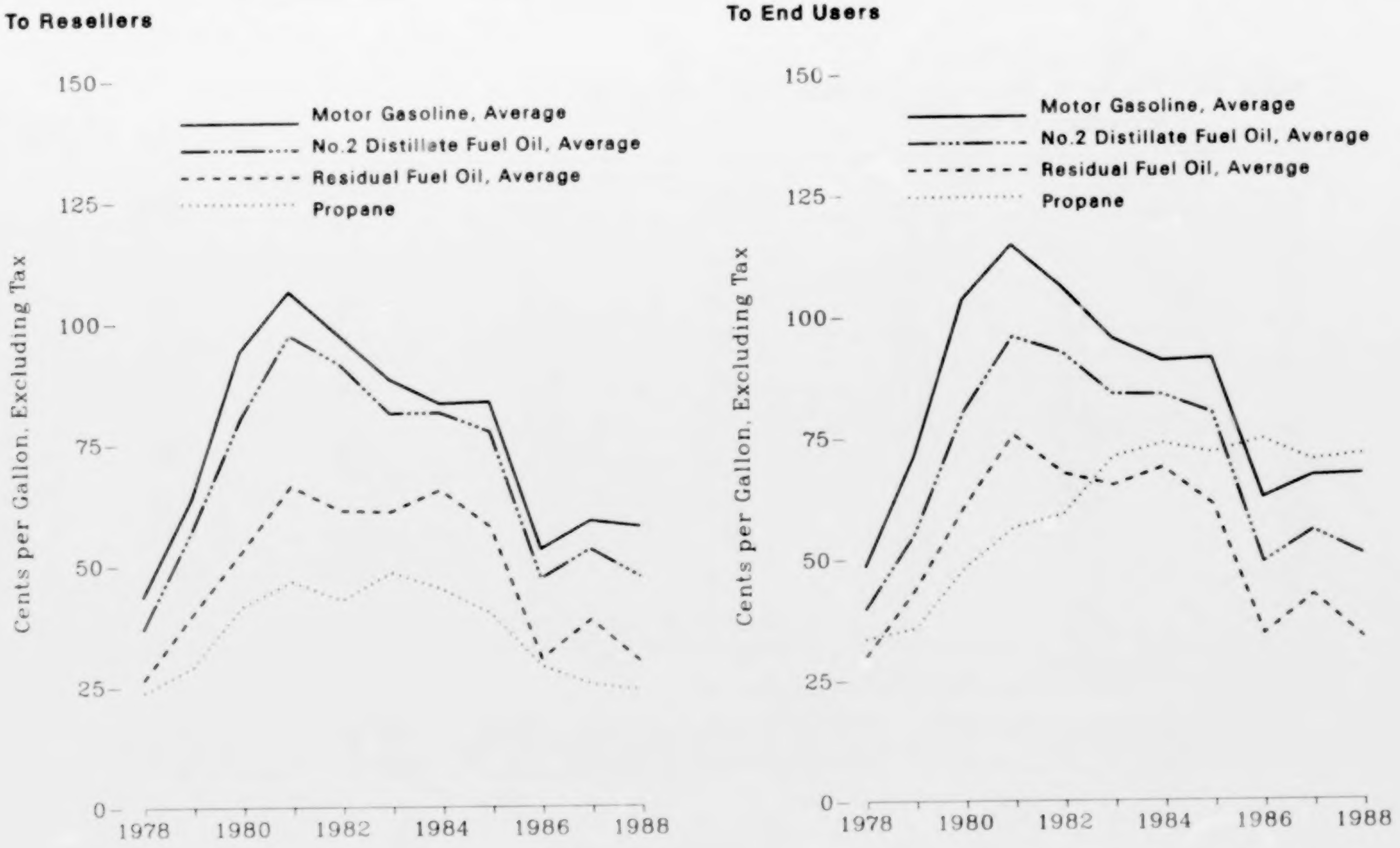
[2] Data 1968 through 1973 are estimated. See Appendix E, Note 10.

[3] In 1982 dollars, calculated using implicit GNP price deflators. See Appendix C.

[4] Preliminary.

Sources: •1974 through January 1976—Federal Energy Administration, Form FEO-96, "Monthly Cost Allocation Report." •February 1976 through September 1977—Federal Energy Administration, Form FEA-P110-M-1, "Refiners' Monthly Cost Allocation Report." •October 1977 through June 1978—Energy Information Administration, Form FEA-P110-M-1, "Refiners' Monthly Cost Allocation Report." •July 1978 through December 1980—Energy Information Administration, Form ERA-49, "Domestic Crude Oil Entitlements Program Refiners Monthly Report." •1981 and forward—Energy Information Administration, Form EIA-14, "Refiners' Monthly Cost Report."

Figure 66. Refiner Sales Prices of Petroleum Products, 1978–1988



Source: See Table 66.

Table 66. Refiner Sales Prices of Petroleum Products, 1978-1988

(Cents per Gallon, Excluding Taxes)

Product	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988 [1]
To Resellers:											
Aviation Gasoline	53.7	72.1	112.8	125.0	122.8	117.8	116.5	113.0	91.2	85.9	85.2
Motor Gasoline											
Leaded Regular	NA	NA	NA	NA	NA	85.0	79.5	79.3	50.1	56.5	54.8
Unleaded Regular	NA	NA	NA	NA	NA	89.5	84.2	84.3	52.2	56.9	54.7
Premium	NA	NA	NA	NA	NA	96.4	91.6	92.2	61.0	67.1	67.3
Average	43.4	63.7	94.1	106.4	97.3	88.2	83.2	83.5	53.1	58.9	57.7
Kerosene	40.4	62.4	86.4	106.6	101.8	89.2	91.6	87.4	60.6	59.2	54.9
Jet Fuel, Kerosene-Type	38.6	66.0	86.8	101.2	95.3	85.4	83.0	79.4	49.5	53.8	49.4
No. 1 Distillate Fuel Oil	40.6	58.3	88.0	107.1	103.8	89.6	89.2	86.3	57.9	59.9	54.9
No. 2 Distillate Fuel Oil											
No. 2 Fuel Oil	36.9	56.9	80.3	97.6	91.4	81.5	82.1	77.6	48.6	52.7	47.3
No. 2 Diesel Oil	36.5	57.4	80.1	97.2	91.4	80.8	80.3	77.2	45.2	53.4	47.3
Average	36.7	57.1	80.2	97.4	91.4	81.2	81.3	77.4	47.0	53.1	47.3
No. 4 Distillate Fuel Oil [2]	30.5	47.0	67.0	78.3	73.7	72.6	70.7	67.2	40.9	46.2	41.0
Residual Fuel Oil											
1% or Less Sulfur Content	29.3	45.0	60.8	74.8	69.5	64.3	68.5	61.0	32.8	41.2	33.3
Greater than 1% Sulfur Content	24.5	36.6	47.9	62.2	57.2	59.1	63.9	56.0	28.9	36.2	26.6
Average	26.3	39.9	52.8	66.3	61.2	60.9	65.4	57.7	30.5	38.5	29.7
Propane (Consumer Grade)	23.7	29.1	41.5	46.6	42.7	48.4	45.0	39.8	29.0	25.2	23.9
To End Users:											
Aviation Gasoline	51.6	68.9	108.4	130.3	131.2	125.5	123.4	120.1	101.1	90.7	89.4
Motor Gasoline											
Leaded Regular	NA	NA	NA	NA	NA	90.6	84.8	84.2	57.3	61.8	62.0
Unleaded Regular	NA	NA	NA	NA	NA	97.0	91.5	91.7	61.6	65.0	64.1
Premium	NA	NA	NA	NA	NA	105.7	101.5	102.3	73.7	78.4	78.9
Average	48.4	71.3	103.5	114.7	106.0	95.4	90.7	91.2	62.4	66.9	67.2
Kerosene	42.1	58.5	90.2	112.3	108.9	96.1	103.6	103.0	79.0	77.0	73.8
Jet Fuel, Kerosene-Type	38.7	54.7	86.8	102.4	96.3	87.8	84.2	79.6	52.9	54.3	51.2
No. 1 Distillate Fuel Oil	40.9	57.2	83.4	103.9	102.3	96.2	92.7	88.0	62.0	60.4	56.4
No. 2 Distillate Fuel Oil											
No. 2 Fuel Oil	40.0	51.6	78.8	91.4	90.5	91.6	91.6	84.9	56.0	58.1	54.3
No. 2 Diesel Oil	37.7	58.5	81.8	99.5	94.2	82.6	82.3	78.9	47.8	55.1	50.0
Average	39.6	55.1	80.4	95.8	92.5	83.9	83.7	79.9	49.1	55.6	50.7
No. 4 Distillate Fuel Oil [2]	31.1	47.9	68.2	79.7	75.0	76.6	79.6	77.3	48.9	51.3	46.0
Residual Fuel Oil											
1% or Less Sulfur Content	31.4	46.8	67.5	82.9	74.7	69.5	72.0	64.4	37.2	44.7	37.2
Greater than 1% Sulfur Content	27.5	38.9	52.3	67.3	61.1	61.1	65.9	58.2	31.7	39.6	30.0
Average	29.8	43.6	60.7	75.6	67.6	65.1	68.7	61.0	34.3	42.3	33.4
Propane (Consumer Grade)	33.5	35.7	48.2	56.5	59.2	70.9	73.7	71.7	74.5	70.1	71.3

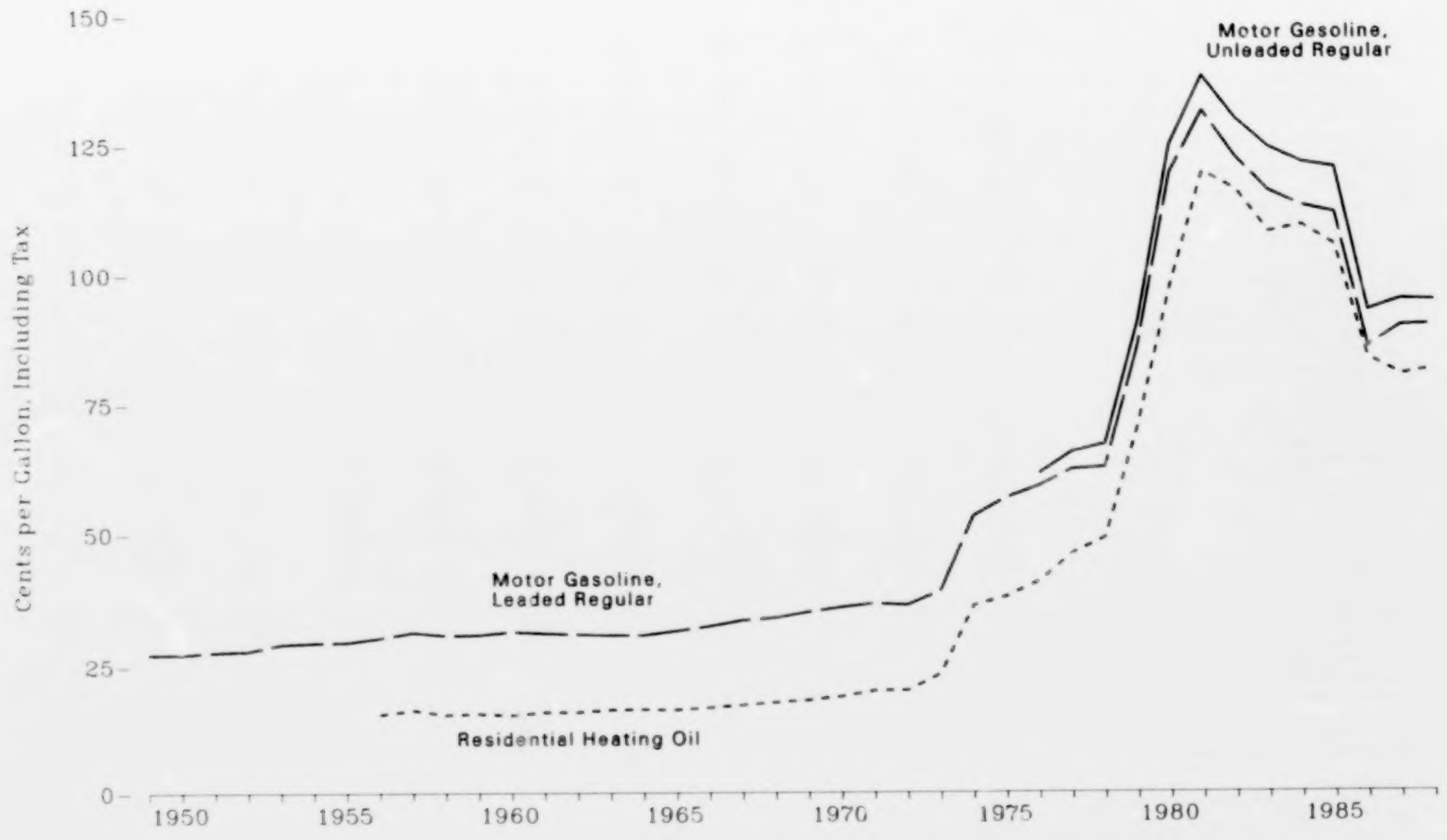
[1] Preliminary.

[2] Includes No. 4 fuel oil and No. 4 diesel fuel.

NA = Not available.

Sources: •1978 through 1982—Energy Information Administration, Form EIA-460, "Petroleum Industry Monthly Report for Product Prices," the source for backcast estimates. •1983 and forward—Energy Information Administration, Form EIA-782A, "Monthly Petroleum Product Sales Report."

Figure 67. Motor Gasoline and Residential Heating Oil Retail Prices, 1949–1988



Source: See Table 67.

Table 67. Motor Gasoline and Residential Heating Oil Retail Prices, 1949-1988

(Cents per Gallon)

Year	Motor Gasoline (Including Taxes)				Residential Heating Oil [2]	
	Leaded Regular [1]		Unleaded Regular [1]			
	Current	Constant [3]	Current	Constant [3]	Current	Constant [3]
1949	26.8	114.0	NA	NA	NA	NA
1950	26.8	112.1	NA	NA	NA	NA
1951	27.2	108.4	NA	NA	NA	NA
1952	27.4	107.5	NA	NA	NA	NA
1953	28.7	110.8	NA	NA	NA	NA
1954	29.0	110.3	NA	NA	NA	NA
1955	29.1	107.0	NA	NA	NA	NA
1956	29.9	106.4	NA	NA	15.2	54.1
1957	31.0	106.5	NA	NA	16.0	55.0
1958	30.4	102.4	NA	NA	15.1	50.8
1959	30.5	100.3	NA	NA	15.3	50.3
1960	31.1	100.6	NA	NA	15.0	48.5
1961	30.8	98.7	NA	NA	15.6	50.0
1962	30.6	95.9	NA	NA	15.6	48.9
1963	30.4	93.8	NA	NA	16.0	49.4
1964	30.4	92.4	NA	NA	16.1	48.9
1965	31.2	92.3	NA	NA	16.0	47.3
1966	32.1	91.7	NA	NA	16.4	46.9
1967	33.2	92.5	NA	NA	16.9	47.1
1968	33.7	89.4	NA	NA	17.4	46.2
1969	34.8	87.4	NA	NA	17.8	44.7
1970	35.7	85.0	NA	NA	18.5	44.0
1971	36.4	82.0	NA	NA	19.6	44.1
1972	36.1	77.6	NA	NA	19.7	42.4
1973	38.8	78.4	NA	NA	22.8	46.1
1974	53.2	98.5	NA	NA	36.0	66.7
1975	56.7	95.6	NA	NA	37.7	63.6
1976	59.0	93.5	61.4	97.3	40.6	64.3
1977	62.2	92.4	65.6	97.5	46.0	68.4
1978	62.6	86.7	67.0	92.8	49.0	67.9
1979	85.7	109.0	90.3	114.9	70.4	89.6
1980	119.1	139.0	124.5	145.3	97.4	113.7
1981	131.1	139.5	137.8	146.6	119.4	127.0
1982	122.2	122.2	129.6	129.6	116.0	116.0
1983	115.7	111.4	124.1	119.4	107.8	103.8
1984	112.9	104.8	121.2	112.5	109.1	101.3
1985	111.5	100.5	120.2	108.4	105.3	95.0
1986	85.7	75.2	92.7	81.4	83.6	73.4
1987	89.7	76.2	94.8	80.5	80.3	68.2
1988	89.9	73.9	94.6	77.7	[4] 81.4	[4] 66.9

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[1] Average motor gasoline prices are calculated from a sample of service stations providing all types of service (i.e., full-, mini-, and self-serve). Geographic coverage - 1949 through 1973, 55 representative cities; 1974 through 1977, 56 urban areas; 1978 forward, 85 urban areas. [2] Average residential heating oil (No. 2 fuel oil) prices are derived by dividing the sum of the estimated national value of retail sales for residential heating by the estimated volume of retail sales for residential heating. Data for 1978 and forward exclude all taxes. [3] In 1982 dollars, calculated using implicit GNP price deflators. See Appendix C. [4] Preliminary. NA = Not available. Sources: **Motor Gasoline, Leaded Regular**: •1949 through 1973—*Platt's Oil Price Handbook and Oilmanac, 1974*, 51st Edition. •1974 and forward—Bureau of Labor Statistics, *Consumer Prices: Energy*, monthly. **Motor Gasoline, Unleaded Regular**: •1949 through 1973—*Platt's Oil Price Handbook and Oilmanac, 1974*, 51st Edition. •1974 and forward—Bureau of Labor Statistics, *Consumer Prices: Energy*, monthly. **Residential Heating Oil**: •1956 through 1974—Bureau of Labor Statistics, *Retail Prices and Indexes of Fuels and Utilities for Residential Usage*, monthly. •January 1975 through September 1977—Federal Energy Administration, Form FEA P112-M-1, "No. 2 Heating Oil Supply/Price Monitoring Report." •October 1977 through December 1977—Energy Information Administration, Form EIA 9, "No. 2 Heating Oil Supply/Price Monitoring Report." •1978 through 1982—Energy Information Administration, Form EIA-9A, "No. 2 Distillate Price Monitoring Report," the source for backcast estimates. •1983 and forward—Energy Information Administration, Form EIA-782A, "Monthly Petroleum Product Sales Report" and Form EIA-782B, "Monthly No. 2 Distillate Sales Report."

6. Natural Gas

Price Changes in a Regulated Market

Due to different Federal and State rate structures, there are many price categories for natural gas. In addition, prices to consumers vary by region; for example, prices are lower in main producing areas, where transmission costs are lower. Estimated data indicate that the average wellhead price of all categories of natural gas rose from $1.67 per thousand cubic feet in 1987 to $1.71 in 1988 (74).[1] In real terms,[2] however, the average wellhead price per thousand cubic feet declined slightly, from $1.42 to $1.41.

When wellhead prices change, savings or price increases are passed on to consumers differentially. In 1986 (the most recent year for which complete data are available), the average wellhead price declined 23 percent. The price to industrial consumers fell 18 percent to $3.06 per thousand cubic feet and the price to electric utilities fell 32 percent to $2.43 per thousand cubic feet (75). On the other hand, the price to the residential sector, where distribution costs are higher and ratesetting may lag market adjustments, fell only 5 percent, to $5.83 per thousand cubic feet.

Sectoral Patterns of Demand

Throughout the 1950's and 1960's, the market for natural gas expanded as low prices encouraged demand (72). Of the many factors affecting natural gas markets during those decades, Federal and State regulatory commissions were the most influential. Below-market rates for certain categories of natural gas coupled with strong demand ultimately resulted in regional shortages during the second half of the 1970's.

In 1972, total consumption of natural gas reached an all-time high of 22 trillion cubic feet. Thereafter, uncertainties about supply and rising energy prices began to erode demand. By the 1980's, lower demand resulted in a short-term surplus of deliverable gas and production curtailments in many producing areas. In 1986, natural gas consumption totaled 16 trillion cubic feet, the lowest annual total since 1965.

Weakened demand spanned all end-use sectors but was most severe in the industrial and electric utility sectors, where, particularly during the early and mid-1980's, the option of fuel switching proved to be most viable. Lower consumption by the industrial sector accounted for over half of the 6-trillion-cubic-foot reduction from 1972 through 1986, and lower use at electric utilities accounted for close to one-fourth.

Meeting Peak Demand

Seasonal, and even daily, fluctuations in natural gas demand are met by withdrawals from storage when demand is high and by injections into storage when demand is low compared with available gas flow in transmission lines. Net withdrawals from storage can provide more than half of some companies' peak winter deliveries. During the 1987–88 heating season (October through March), net withdrawals of natural gas from storage supplied nearly 13 percent of total consumption.[3]

Natural gas in storage at the end of the year increased throughout the period of the 1970's when local shortages resulted in curtailments to some consumers (73). Underground storage of working gas—that in excess of the base gas needed to maintain optimum reservoir pressure—equalled 7 percent of annual consumption in 1969 and 16 percent in 1988. At the end of 1988, working gas in storage was 2.9 trillion cubic feet and base gas was 3.8 trillion cubic feet.

[3] Energy Information Administration, *Monthly Energy Review* December 1988, DOE/EIA-0035(88/12) (Washington, DC, March 1989), Tables 4.3 and 4.4.

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[1] Numbers in parentheses indicate related tables. Annual data are the most recent available and frequently are preliminary.

[2] Real prices are expressed in constant 1982 dollars. Prices are nominal unless specifically noted as real.

On a share basis, industrial consumption fell from 44 percent in 1972 to 40 percent in 1986, while the electric utilities' share fell from 18 percent to 16 percent in the same period. In contrast, residential consumption accounted for a larger share of the total in 1986 compared with 1972; its share rose from 23 percent to 27 percent. Similarly, the commercial sector's share rose from 12 percent to 14 percent. The amount of natural gas used as pipeline fuel (transportation use) declined faster than did total consumption of natural gas and, in 1986, accounted for a 3-percent share.

The 1986 low point in natural gas consumption was followed by 2 consecutive years of growth. Consumption in 1987 totaled 17 trillion cubic feet and rose 5 percent in 1988 to 18 trillion cubic feet. Although consumption at electric utilities declined, consumption by all other end-use sectors increased. Severe weather conditions—an unusually cold winter and extremely hot summer—boosted demand in the residential and commercial sectors and growth in manufacturing output was accompanied by an increase in demand by the industrial sector. The industrial sector remained the largest consumer of natural gas and, in 1988, accounted for 42 percent of the U.S. total.

Natural Gas Production and Productivity

In 1988, gross withdrawals of natural gas rose to 20 trillion cubic feet, up 2 percent from the year before but considerably below the level during the early 1970's, when withdrawals averaged 24 trillion cubic feet per year (69). Texas, Louisiana, and Oklahoma, the largest producers of natural gas, accounted for 69 percent of the U.S. total (71). Most withdrawals came from onshore wells and State offshore wells, but 5 trillion cubic feet (close to one-fourth of the total) were Federal offshore withdrawals.

The 20 trillion cubic feet of gross withdrawals in 1988 yielded 17 trillion cubic feet of marketed production (69). Reservoir repressuring, removal of nonhydrocarbon gases, and venting and flaring accounted for 3 trillion cubic feet.

About 256 thousand gas wells were in operation during 1988 (71). Withdrawals from those wells accounted for almost three-fourths of all gross withdrawals, while oil wells supplied most of the remainder (69). After peaking at 435 thousand cubic feet per day in 1971 (71), average gas well productivity declined each year except 1984 and 1987 until, by 1988, average productivity had fallen to 161 thousand cubic feet per day.

Small amounts of methane, the main constituent of natural gas, were recovered from coalbeds. In 1987 (the most recent year for which data are available), commercial recovery was estimated at about 26 billion cubic feet.[4] Coalbed methane accounted for a sizable share of production in Alabama.

Imports and Exports

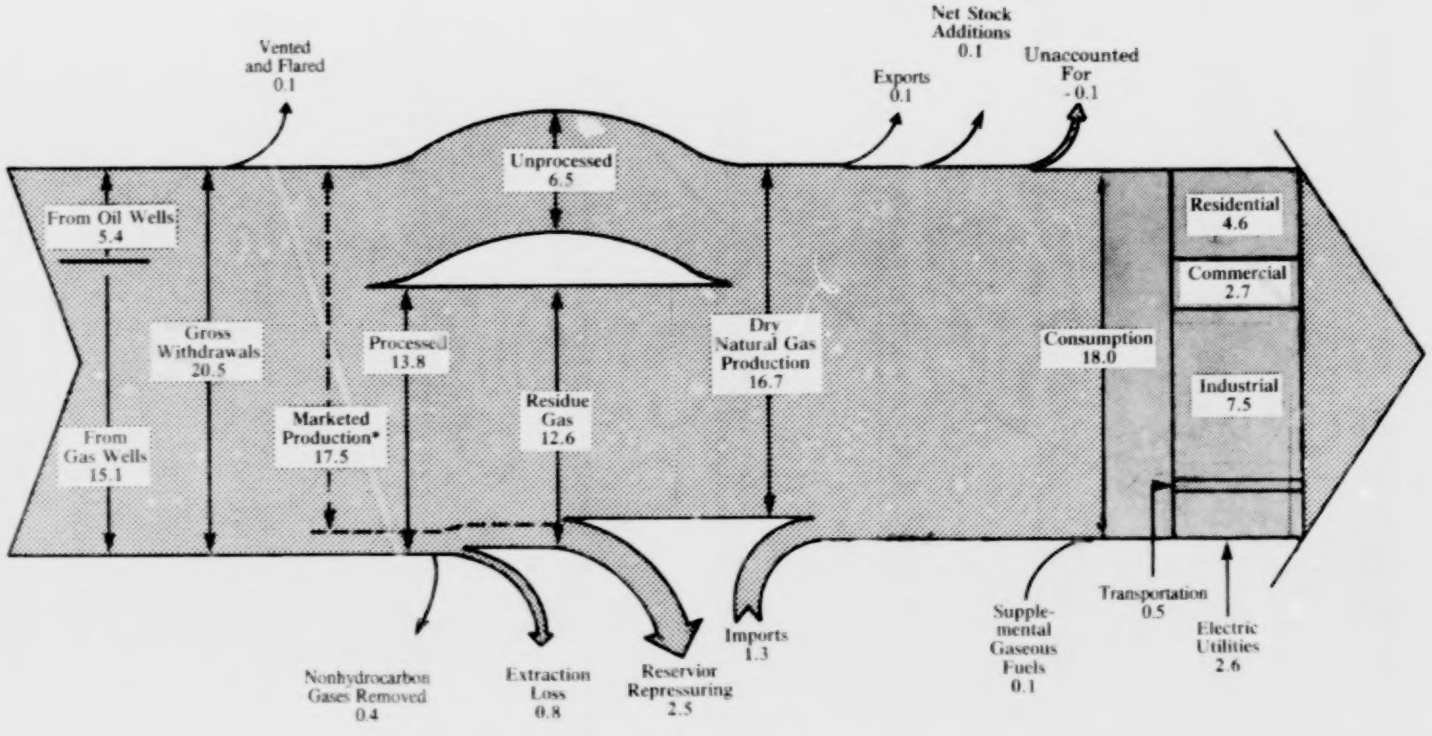
U.S. natural gas trade was limited to the border countries of Mexico and Canada until shipping natural gas in liquefied form emerged as an alternative to pipelines. In 1969, the first shipments of liquefied natural gas (LNG) were sent to Japan, and U.S. imports from Algeria began the following year (70). In 1988, U.S. net imports of natural gas by all routes totaled 1.2 trillion cubic feet, up 31 percent from 1987 net imports and the equivalent of 6.8 percent of domestic consumption, up from 5.5 percent in 1987.

Historically, Canada has been the major supplier of U.S. natural gas imports, with Mexico and, more recently, Algeria supplying smaller amounts. For the 3-year period of 1986 through 1988, however, U.S. net imports from Mexico fell essentially to zero and net imports from Algeria were 17 billion cubic feet. Meanwhile, Canada supplied net imports of 739 billion cubic feet in 1986, 989 billion cubic feet in 1987, and 1.3 trillion cubic feet in 1988.

Since 1969, Japan has displaced both Canada and Mexico to become the primary purchaser of U.S. natural gas. In 1988, shipments of liquefied natural gas from Alaska to Japan totaled 52 billion cubic feet.

[4] Energy Information Administration, *Natural Gas Monthly* September 1988, DOE/EIA-0130(88/09) (Washington, DC, December 1988), p. 3.

Diagram 3. Natural Gas Flow, 1988
(Trillion Cubic Feet)



Vented and Flared 0.1
Unprocessed 6.5
Exports 0.1
Net Stock Additions 0.1
Unaccounted For -0.1
From Oil Wells 5.4
Gross Withdrawals 20.5
From Gas Wells 15.1
Marketed Production* 17.5
Processed 13.8
Residue Gas 12.6
Dry Natural Gas Production 16.7
Consumption 18.0
Residential 4.6
Commercial 2.7
Industrial 7.5
Nonhydrocarbon Gases Removed 0.4
Extraction Loss 0.8
Reservior Repressuring 2.5
Imports 1.3
Supple- mental Gaseous Fuels 0.1
Transportation 0.5
Electric Utilities 2.6

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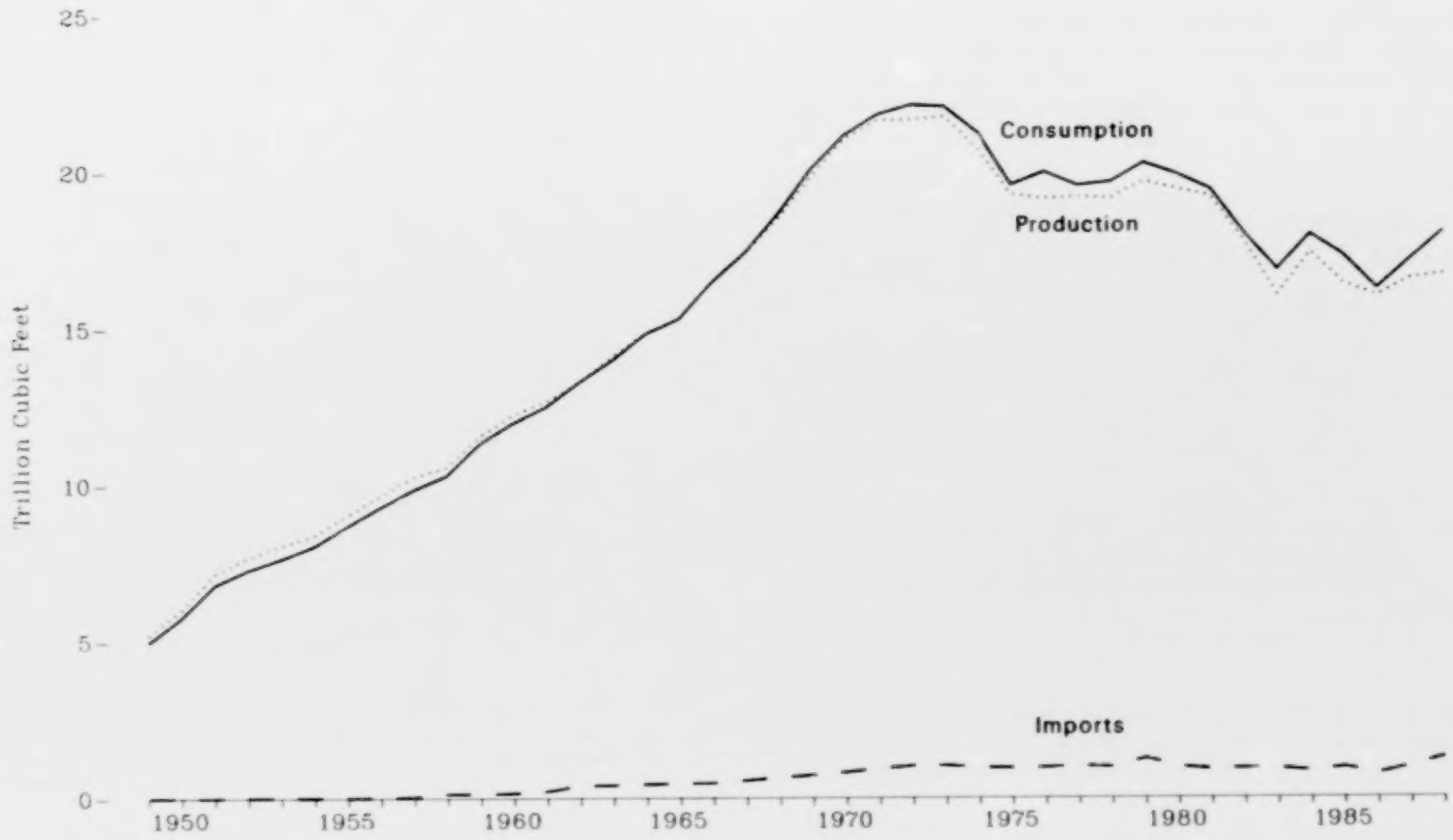
* See Glossary.

Note: Sum of components may not equal totals due to independent rounding.

Sources: See Tables 68, 69, and 72.

Figure 68. Natural Gas Overview, 1949-1988



Source: See Table 68.

Table 68. Natural Gas Overview, 1949-1988

(Trillion Cubic Feet)

Year	Dry Natural Gas Production	Supplemental Gaseous Fuels	Imports	Exports	Withdrawals from Storage [1]	Additions to Storage [1]	Unaccounted For [2]	Consumption
1949	5.20	NA	0	0.02	0.11	0.17	0.14	4.97
1950	6.02	NA	0	0.03	0.18	0.23	0.18	5.77
1951	7.16	NA	0	0.02	0.21	0.35	0.19	6.81
1952	7.69	NA	0.01	0.03	0.22	0.40	0.20	7.29
1953	8.06	NA	0.01	0.03	0.25	0.40	0.24	7.64
1954	8.39	NA	0.01	0.03	0.33	0.43	0.22	8.05
1955	9.03	NA	0.01	0.03	0.44	0.51	0.25	8.69
1956	9.66	NA	0.01	0.04	0.45	0.59	0.21	9.29
1957	10.25	NA	0.04	0.04	0.48	0.67	0.21	9.85
1958	10.57	NA	0.14	0.04	0.62	0.70	0.28	10.30
1959	11.55	NA	0.13	0.02	0.67	0.79	0.22	11.32
1960	12.23	NA	0.16	0.01	0.71	0.84	0.27	11.97
1961	12.66	NA	0.22	0.01	0.70	0.84	0.23	12.49
1962	13.25	NA	0.40	0.02	0.85	0.94	0.29	13.27
1963	14.08	NA	0.41	0.02	0.92	1.05	0.36	13.97
1964	14.82	NA	0.44	0.02	0.89	1.01	0.30	14.81
1965	15.29	NA	0.46	0.03	0.96	1.08	0.32	15.28
1966	16.47	NA	0.48	0.02	1.14	1.21	0.40	16.45
1967	17.39	NA	0.56	0.08	1.13	1.32	0.30	17.39
1968	18.49	NA	0.65	0.09	1.33	1.43	0.33	18.63
1969	19.83	NA	0.73	0.05	1.38	1.50	0.33	20.06
1970	21.01	NA	0.82	0.07	1.46	1.86	0.23	21.14
1971	21.61	NA	0.93	0.08	1.51	1.84	0.34	21.79
1972	21.62	NA	1.02	0.08	1.76	1.89	0.33	22.10
1973	21.73	NA	1.03	0.08	1.53	1.97	0.20	22.05
1974	20.71	NA	0.96	0.08	1.70	1.78	0.29	21.22
1975	19.24	NA	0.95	0.07	1.76	2.10	0.24	19.54
1976	19.10	NA	0.96	0.06	1.92	1.76	0.22	19.95
1977	19.16	NA	1.01	0.06	1.75	2.31	0.04	19.52
1978	19.12	NA	0.97	0.05	2.16	2.28	0.29	19.63
1979	19.66	NA	1.25	0.06	2.05	2.30	0.37	20.24
1980	19.40	0.15	0.98	0.05	1.97	1.95	0.64	19.88
1981	19.18	0.18	0.90	0.06	1.93	2.23	0.50	19.40
1982	17.76	0.14	0.93	0.05	2.16	2.47	0.47	18.00
1983	16.03	0.13	0.92	0.05	2.27	1.82	0.64	16.83
1984	17.39	0.11	0.84	0.05	2.10	2.30	0.14	17.95
1985	16.38	0.13	0.95	0.06	2.40	2.16	0.35	17.28
1986	15.99	0.11	0.75	0.06	1.84	1.98	0.43	16.22
1987	16.54	0.10	0.99	0.05	1.91	1.91	0.43	17.14
1988[3]	16.68	0.14	1.28	0.06	2.14	2.26	- 0.12	18.04

[1] Beginning with 1980, includes liquefied natural gas (LNG) storage in above ground tanks.

[2] Unaccounted for gas, excluding intransit shipments for 1980 forward, is the imbalance between available supplies for consumption and actual consumption.

[3] Preliminary.

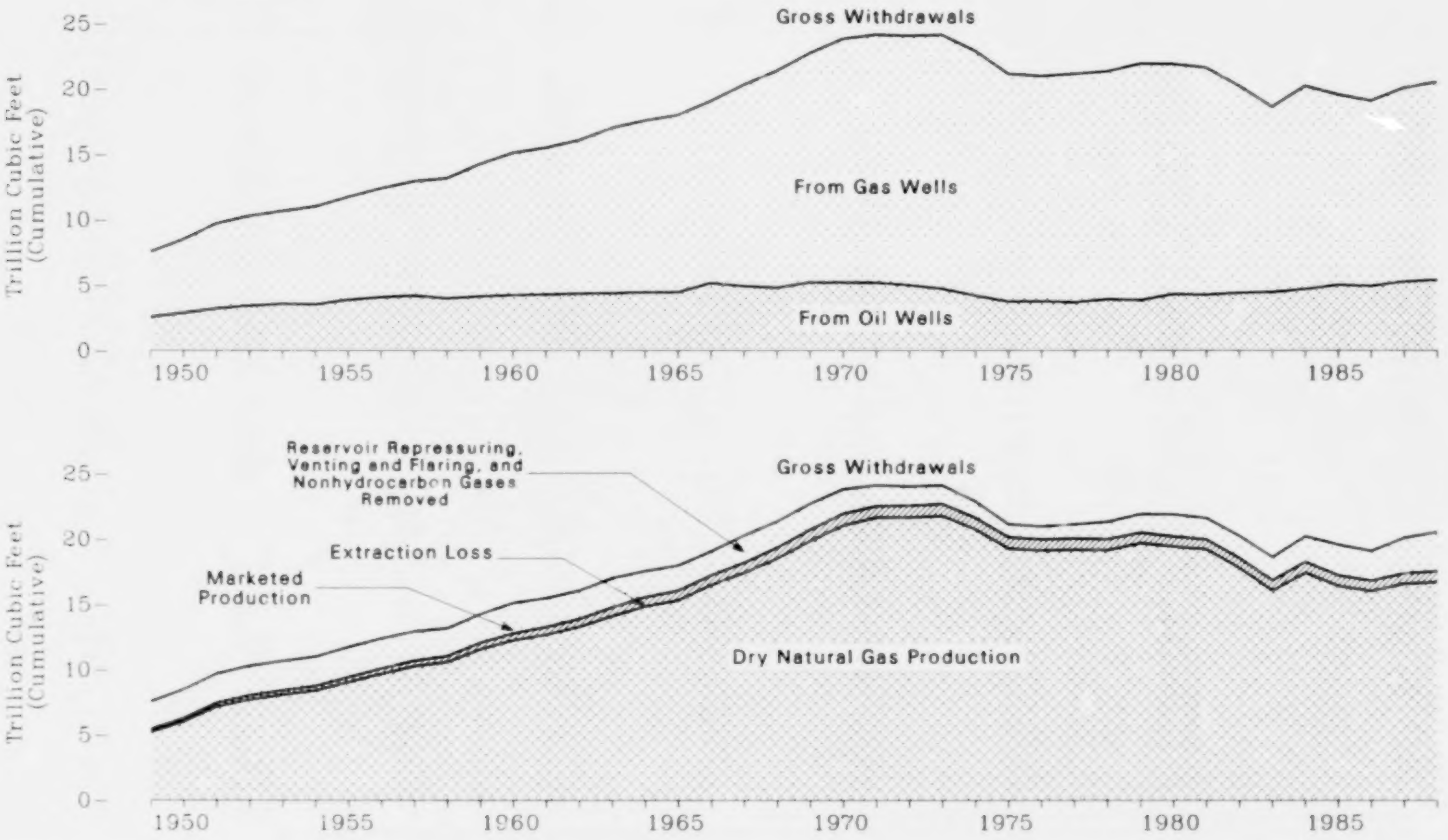
NA = Not available.

Note: Sum of components may not equal total due to independent rounding.

Note: Beginning with 1965, all volumes are shown on a pressure base of 14.73 p.s.i.a. at 60 °F. For prior years, the pressure base is 14.65 p.s.i.a. at 60 °F.

Sources: •1949 through 1987—Energy Information Administration, *Natural Gas Annual 1987* (October 1988), Table26. •1988—Energy Information Administration, *Natural Gas Monthly* January 1989 (March 1989).

Figure 69. Natural Gas Production, 1949-1988



Source: See Table 69.

Table 69. Natural Gas Production, 1949-1988

(Trillion Cubic Feet)

Year	Gross Withdrawals			Reservoir Repressuring	Non-hydrocarbon Gases Removed	Vented and Flared	Marketed Production	Extraction Loss[1]	Dry Natural Gas Production
	From Gas Wells	From Oil Wells	Total						
1949	4.99	2.56	7.55	1.27	NA	0.85	5.42	0.22	5.20
1950	5.60	2.88	8.48	1.40	NA	0.80	6.28	0.26	6.02
1951	6.48	3.21	9.69	1.44	NA	0.79	7.46	0.29	7.16
1952	6.84	3.43	10.27	1.41	NA	0.85	8.01	0.32	7.69
1953	7.10	3.55	10.65	1.44	NA	0.81	8.40	0.34	8.06
1954	7.47	3.52	10.98	1.52	NA	0.72	8.74	0.35	8.39
1955	7.84	3.88	11.72	1.54	NA	0.77	9.41	0.38	9.03
1956	8.31	4.07	12.37	1.43	NA	0.86	10.08	0.42	9.66
1957	8.72	4.19	12.91	1.42	NA	0.81	10.68	0.43	10.25
1958	9.15	3.99	13.15	1.48	NA	0.63	11.03	0.46	10.57
1959	10.10	4.13	14.23	1.61	NA	0.57	12.05	0.50	11.55
1960	10.85	4.23	15.09	1.75	NA	0.56	12.77	0.54	12.23
1961	11.20	4.27	15.46	1.68	NA	0.52	13.25	0.59	12.66
1962	11.70	4.34	16.04	1.74	NA	0.43	13.88	0.62	13.25
1963	12.61	4.37	16.97	1.84	NA	0.38	14.75	0.67	14.08
1964	13.11	4.43	17.54	1.65	NA	0.34	15.55	0.72	14.82
1965	13.52	4.44	17.96	1.60	NA	0.32	16.04	0.75	15.29
1966	13.89	5.14	19.03	1.45	NA	0.38	17.21	0.74	16.47
1967	15.35	4.91	20.25	1.59	NA	0.49	18.17	0.78	17.39
1968	16.54	4.79	21.33	1.49	NA	0.52	19.32	0.83	18.49
1969	17.49	5.19	22.68	1.46	NA	0.53	20.70	0.87	19.83
1970	18.59	5.19	23.79	1.38	NA	0.49	21.92	0.91	21.01
1971	18.93	5.16	24.09	1.31	NA	0.28	22.49	0.88	21.61
1972	19.04	4.97	24.02	1.24	NA	0.25	22.53	0.91	21.62
1973	19.37	4.70	24.07	1.17	NA	0.25	22.65	0.92	21.73
1974	18.67	4.18	22.85	1.08	NA	0.17	21.60	0.89	20.71
1975	17.38	3.72	21.10	0.86	NA	0.13	20.11	0.87	19.24
1976	17.19	3.75	20.94	0.86	NA	0.13	19.95	0.85	19.10
1977	17.42	3.68	21.10	0.93	NA	0.14	20.03	0.86	19.16
1978	17.39	3.91	21.31	1.18	NA	0.15	19.97	0.85	19.12
1979	18.03	3.85	21.88	1.25	NA	0.17	20.47	0.81	19.66
1980	17.57	4.30	21.87	1.37	0.20	0.13	20.18	0.78	19.40
1981	17.34	4.25	21.59	1.31	0.22	0.10	19.96	0.77	19.18
1982	15.80	4.41	20.21	1.39	0.21	0.09	18.52	0.76	17.76
1983	14.15	4.45	18.60	1.46	0.22	0.09	16.82	0.79	16.03
1984	15.51	4.69	20.19	1.63	0.22	0.11	18.23	0.84	17.39
1985	14.53	5.01	19.53	1.92	0.33	0.09	17.20	0.82	16.38
1986	14.15	4.92	19.06	1.84	0.34	0.10	16.79	0.80	15.99
1987	14.80	5.26	20.06	2.21	0.38	0.12	17.35	0.81	16.54
1988[2]	15.12	5.37	20.49	2.45	0.41	0.14	17.49	0.82	16.68

[1] Volume reduction resulting from the removal of natural gas plant liquids. Natural gas plant liquids are transferred to petroleum supply.

[2] Preliminary.

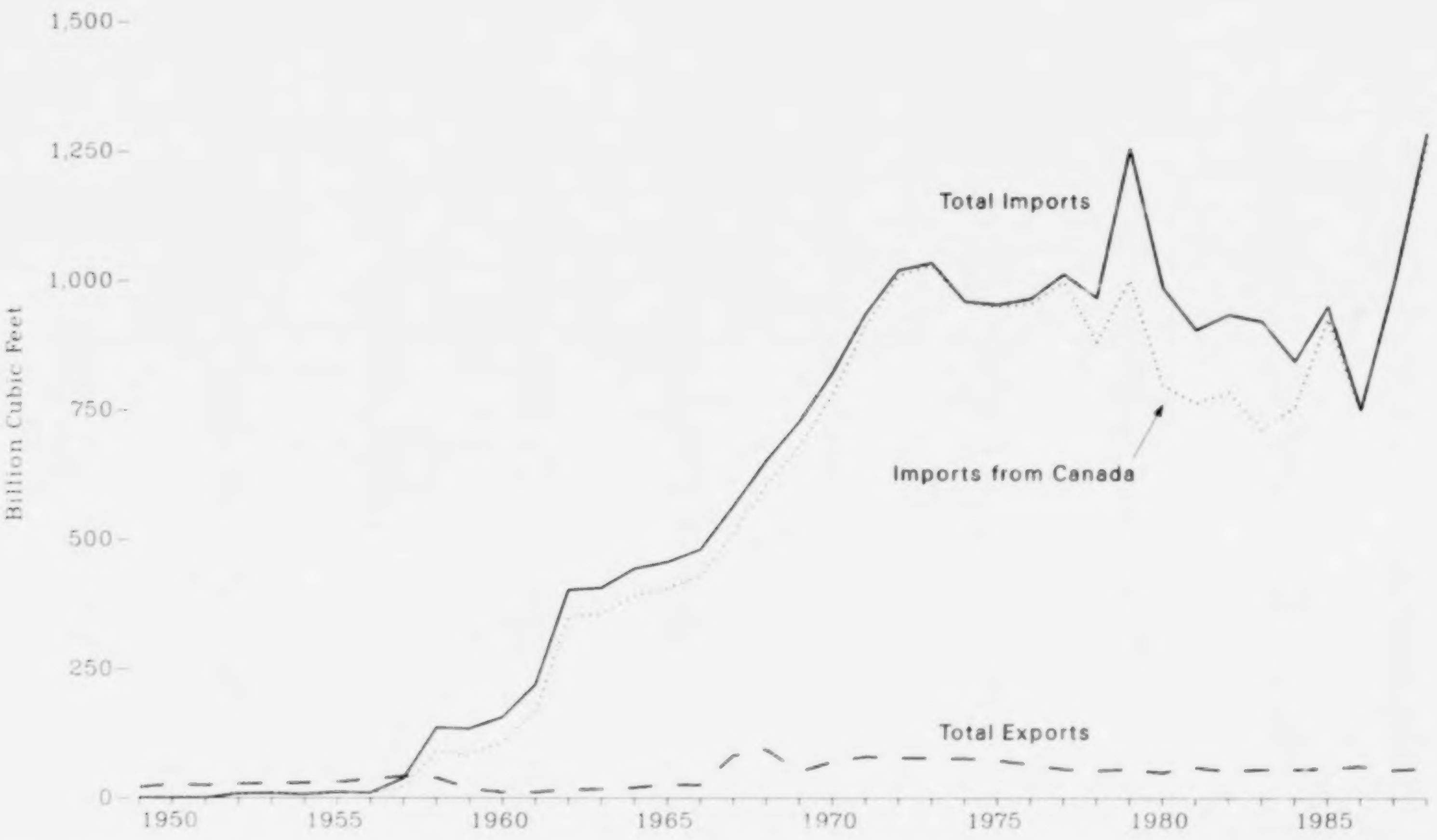
NA = Not available.

Note: Sum of components may not equal total due to independent rounding.

Note: Beginning with 1965 data, all volumes are shown on a pressure base of 14.73 p.s.i.a. at 60 °F. For prior years, the pressure base is 14.65 p.s.i.a. at 60 °F.

Sources: •1949 through 1975—Bureau of Mines, *Minerals Yearbook*, "Natural Gas" chapter. •1976 through 1978—Energy Information Administration, Energy Data Reports, *Natural Gas Annual*. •1979—Energy Information Administration, *Natural Gas Production and Consumption 1979* •1980 through 1987—Energy Information Administration, *Natural Gas Annual*. •1988—Energy Information Administration, *Natural Gas Monthly* January 1989 (March 1989).

Figure 70. Natural Gas Imports and Exports, 1949-1988



Source: See Table 70.

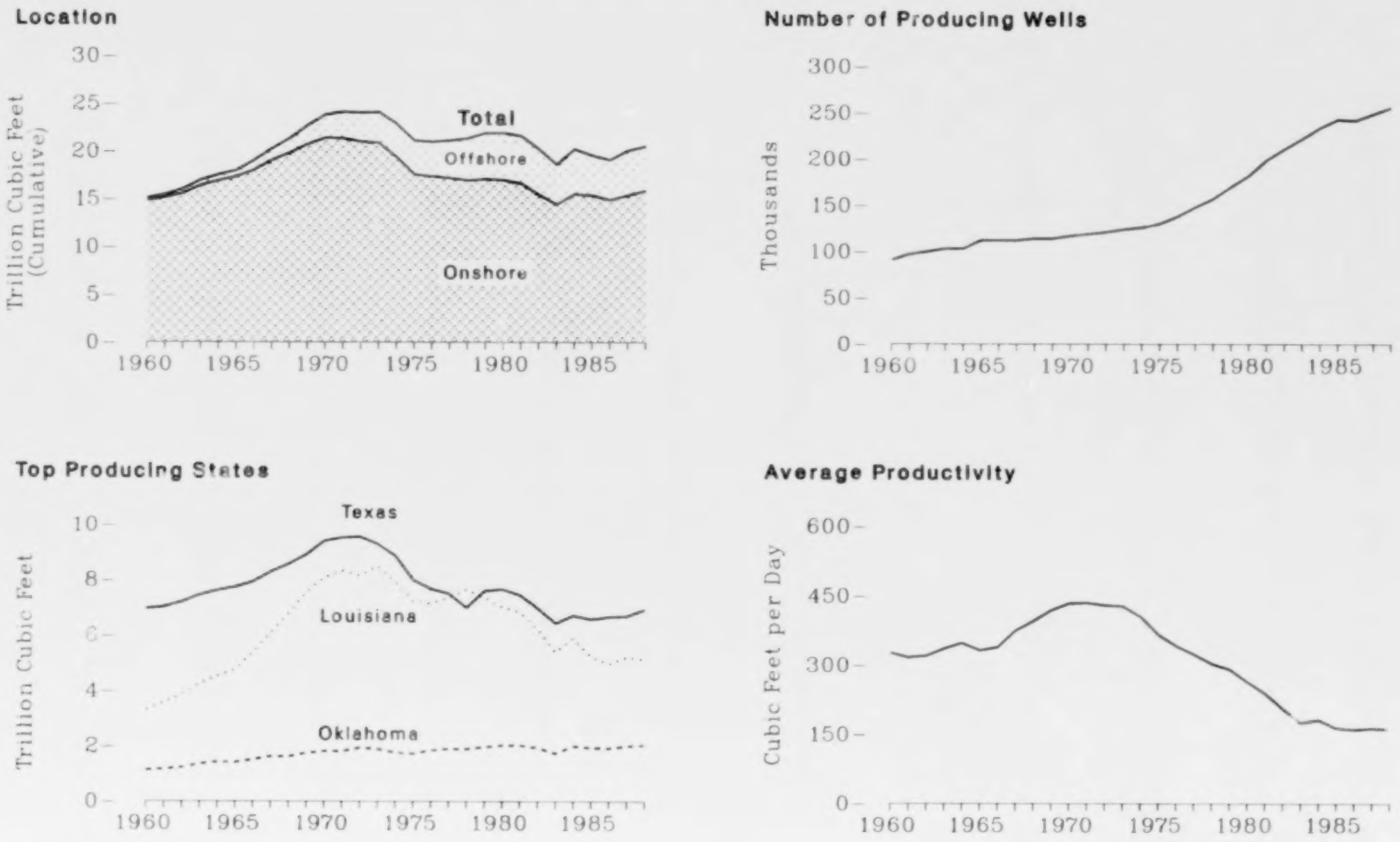
Table 70. Natural Gas Imports, Exports, and Net Imports, 1949-1988

(Billion Cubic Feet, Except as Noted)

Year	Imports by Country of Origin					Exports by Country of Destination				Net Imports [1]	
	Canada	Mexico	Algeria [2]	Indonesia	Total	Canada	Mexico	Japan [2]	Total	Total	Percent of U.S. Consumption
1949	0	0	0	0	0	(3)	20	0	20	-20	(4)
1950	0	0	0	0	0	3	22	0	26	-26	(4)
1951	0	0	0	0	0	4	21	0	24	-24	(4)
1952	8	(3)	0	0	8	6	22	0	27	-20	(4)
1953	9	0	0	0	9	6	22	0	28	-19	(4)
1954	7	0	0	0	7	6	23	0	29	-22	(4)
1955	11	(3)	0	0	11	11	20	0	31	-20	(4)
1956	10	(3)	0	0	10	17	19	0	36	-26	(4)
1957	21	17	0	0	38	31	11	0	42	-4	(4)
1958	90	46	0	0	136	32	7	0	39	97	0.9
1959	83	51	0	0	134	12	7	0	18	116	1.0
1960	109	47	0	0	156	6	6	0	11	144	1.2
1961	167	52	0	0	219	6	5	0	11	208	1.7
1962	350	51	0	0	402	6	10	0	16	386	2.9
1963	356	50	0	0	406	7	10	0	17	389	2.8
1964	391	53	0	0	443	10	10	0	20	424	2.9
1965	405	52	0	0	456	18	8	0	26	430	2.8
1966	430	50	0	0	480	20	4	0	25	455	2.8
1967	513	51	0	0	564	70	11	0	82	433	2.8
1968	604	47	0	0	652	82	12	0	94	558	3.0
1969	680	47	0	0	727	35	13	3	51	676	3.4
1970	779	41	1	0	821	11	15	44	70	751	3.6
1971	912	21	1	0	935	14	16	50	80	854	3.9
1972	1,009	8	2	0	1,019	16	15	48	78	941	4.3
1973	1,028	2	3	0	1,033	15	14	48	77	956	4.3
1974	959	(3)	0	0	959	13	13	50	77	882	4.2
1975	948	0	5	0	953	10	9	53	73	880	4.5
1976	954	0	10	0	964	8	7	50	65	899	4.5
1977	997	2	11	0	1,011	(3)	4	52	56	955	4.9
1978	881	0	84	0	966	(3)	4	48	53	913	4.7
1979	1,001	0	253	0	1,253	(3)	4	51	56	1,198	5.9
1980	797	102	86	0	985	(3)	4	45	49	936	4.7
1981	762	105	37	0	904	(3)	3	56	59	845	4.4
1982	783	95	55	0	933	(3)	2	50	52	882	4.9
1983	713	75	131	0	920	(3)	2	53	55	865	5.1
1984	755	52	36	0	843	(3)	2	53	55	788	4.4
1985	926	0	24	0	949	(3)	2	53	57	892	5.2
1986	748	0	0	2	750	9	2	50	61	689	4.2
1987	992	0	0	0	992	3	2	49	54	938	5.5
1988[5]	1,266	0	17	0	1,283	4	2	52	58	1,225	6.8

[1] Net imports = imports minus exports.
[2] Imports from Algeria and exports to Japan are liquefied natural gas.
[3] Less than 0.5 billion cubic feet.
[4] Not meaningful because there were net exports during this year.
[5] Preliminary.
Note: Sum of components may not equal total due to independent rounding.
Sources: •1949 through 1954—Energy Information Administration, unpublished data. •1955 through 1987—Energy Information Administration, *Natural Gas Monthly* July 1988 (September 1988). •1988—Energy Information Administration, *Natural Gas Monthly* January 1989 (March 1989).

Figure 71. Natural Gas Gross Withdrawals by State and Location and Gas Well Productivity, 1960-1988



Location

Number of Producing Wells

Top Producing States

Average Productivity

Source: See Table 71.

Table 71. Natural Gas Gross Withdrawals by State and Location and Gas Well Productivity, 1960-1988

(Trillion Cubic Feet, Except as Noted)

	State				Location			Gas Well[1] Productivity		
Year	Texas	Louisiana	Oklahoma	Other	Onshore[2]	Offshore[3]	Total	Gross Withdrawals	Thousands of Producing Wells[4]	Average Productivity (thousand feet per day)
1960	6.96	3.31	1.13	3.68	14.81	0.27	15.09	10.85	91	326.7
1961	7.02	3.57	1.16	3.71	15.14	0.32	15.46	11.20	97	316.8
1962	7.20	3.85	1.22	3.76	15.59	0.45	16.04	11.70	100	319.8
1963	7.45	4.25	1.35	3.92	16.41	0.56	16.97	12.61	103	335.4
1964	7.62	4.52	1.42	3.98	16.91	0.62	17.54	13.11	103	347.4
1965	7.74	4.76	1.41	4.04	17.32	0.65	17.96	13.52	112	331.8
1966	7.93	5.37	1.50	4.23	18.03	1.01	19.03	13.89	112	338.4
1967	8.29	6.09	1.62	4.25	19.06	1.19	20.25	15.35	112	374.3
1968	8.57	6.78	1.61	4.37	19.80	1.52	21.33	16.54	114	395.1
1969	8.91	7.56	1.74	4.46	20.72	1.95	22.68	17.49	114	418.6
1970	9.40	8.08	1.81	4.50	21.37	2.42	23.79	18.59	117	433.6
1971	9.52	8.32	1.81	4.44	21.31	2.78	24.09	18.93	119	434.8
1972	9.55	8.16	1.93	4.38	20.98	3.04	24.02	19.04	121	429.4
1973	9.29	8.49	1.89	4.40	20.86	3.21	24.07	19.37	124	427.4
1974	8.86	7.92	1.76	4.31	19.34	3.51	22.85	18.67	126	404.9
1975	7.99	7.24	1.72	4.15	17.55	3.55	21.10	17.38	130	365.3
1976	7.67	7.14	1.84	4.29	17.35	3.60	20.94	17.19	138	341.5
1977	7.50	7.35	1.89	4.36	17.16	3.93	21.10	17.42	148	323.1
1978	6.99	7.64	1.89	4.79	16.95	4.36	21.31	17.39	157	302.7
1979	7.59	7.36	1.96	4.97	17.06	4.82	21.88	18.03	170	290.8
1980	7.66	7.01	2.02	5.19	16.97	4.90	21.87	17.57	182	263.8
1981	7.45	6.83	2.02	5.29	16.60	4.99	21.59	17.34	199	238.9
1982	6.98	6.22	1.93	5.08	15.44	4.77	20.21	15.80	211	205.4
1983	6.43	5.38	1.73	5.06	14.41	4.18	18.60	14.15	222	174.6
1984	6.71	5.89	1.99	5.61	15.49	4.71	20.19	15.51	234	181.2
1985	6.58	5.22	1.94	5.80	15.35	4.19	19.53	14.53	243	163.6
1986	6.66	4.96	1.92	5.52	14.88	4.19	19.06	14.15	242	160.5
1987	6.69	5.20	2.00	6.16	15.38	4.67	20.06	14.80	249	162.7
1988[5]	6.92	5.12	2.03	6.42	15.85	4.64	20.49	15.12	256	161.4

[1] See Glossary.

[2] Includes State offshore gross withdrawals.

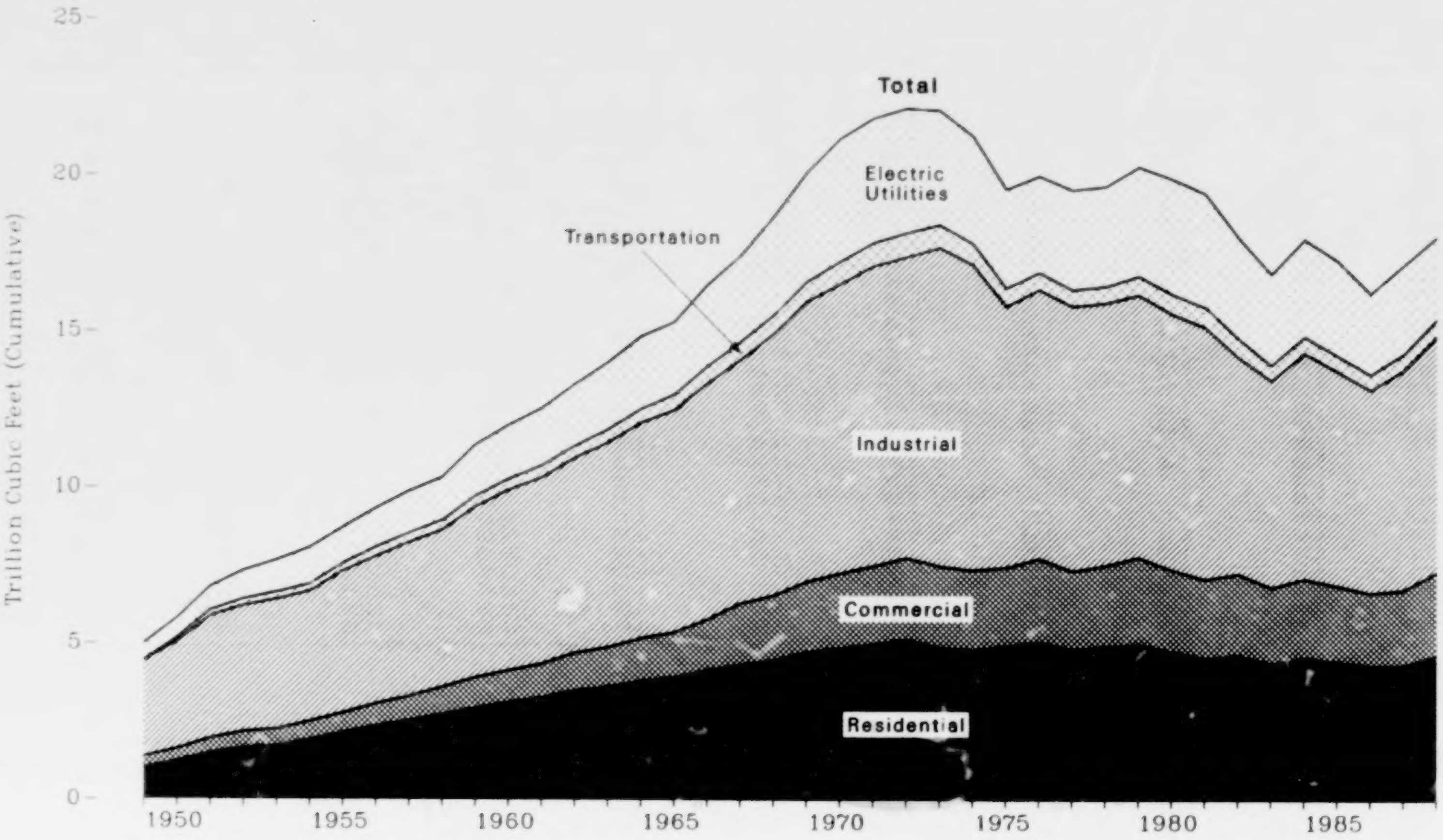
[3] Excludes State offshore gross withdrawals, includes Federal offshore (Outer Continental Shelf) gross withdrawals.

[4] As of December 31.

[5] Preliminary.

Sources: **Offshore** (Outer Continental Shelf): •1960 through 1981—U.S. Geological Survey. •1982 and forward—The United States Minerals Management Service, *Mineral Revenues - The 1985 Report on Receipts from Federal and Indian Leases*, and predecessor annual reports. **All Other Data:** •1960 through 1966—Bureau of Mines, *Natural Gas Production and Consumption*. •1967 through 1987—Energy Information Administration, *Natural Gas Annual 1987* (October 1988). •1988—Energy Information Administration, *Natural Gas Monthly* January 1989 (March 1989), and *World Oil*, February 1989, Gulf Publishing Company, Houston, Texas.

Figure 72. Natural Gas Consumption by End-Use Sector, 1949-1988



Source: See Table 72.

Table 72. Natural Gas Consumption by End-Use Sector,[1] 1949-1988

(Trillion Cubic Feet)

Year	Residential	Commercial[2]	Industrial: Lease and Plant Fuel	Industrial: Other Industrial	Industrial: Total Industrial	Electric Utilities	Transportation[3]	Total
1949	0.99	0.35	0.84	2.25	3.08	0.55	NA	4.97
1950	1.20	0.39	0.93	2.50	3.43	0.63	0.13	5.77
1951	1.47	0.46	1.15	2.77	3.91	0.76	0.19	6.81
1952	1.62	0.52	1.16	2.87	4.04	0.91	0.21	7.29
1953	1.69	0.53	1.13	3.03	4.16	1.03	0.23	7.64
1954	1.89	0.58	1.10	3.07	4.17	1.17	0.23	8.05
1955	2.12	0.63	1.13	3.41	4.54	1.15	0.25	8.69
1956	2.33	0.72	1.00	3.71	4.71	1.24	0.30	9.29
1957	2.50	0.78	1.05	3.89	4.93	1.34	0.30	9.85
1958	2.71	0.87	1.15	3.89	5.03	1.37	0.31	10.30
1959	2.91	0.98	1.24	4.22	5.46	1.63	0.35	11.32
1960	3.10	1.02	1.24	4.53	5.77	1.72	0.35	11.97
1961	3.25	1.08	1.29	4.67	5.96	1.83	0.38	12.49
1962	3.48	1.21	1.37	4.86	6.23	1.97	0.38	13.27
1963	3.59	1.27	1.41	5.13	6.55	2.14	0.42	13.97
1964	3.79	1.37	1.37	5.52	6.89	2.32	0.44	14.81
1965	3.90	1.44	1.16	5.96	7.11	2.32	0.50	15.28
1966	4.14	1.62	1.03	6.51	7.55	2.61	0.54	16.45
1967	4.31	1.96	1.14	6.65	7.79	2.75	0.58	17.39
1968	4.45	2.08	1.24	7.13	8.37	3.15	0.59	18.63
1969	4.73	2.25	1.35	7.61	8.96	3.49	0.63	20.06
1970	4.84	2.40	1.40	7.85	9.25	3.93	0.72	21.14
1971	4.97	2.51	1.41	8.18	9.59	3.98	0.74	21.79
1972	5.13	2.61	1.46	8.17	9.62	3.98	0.77	22.10
1973	4.88	2.60	1.50	8.69	10.18	3.66	0.73	22.05
1974	4.79	2.56	1.48	8.29	9.77	3.44	0.67	21.22
1975	4.92	2.51	1.40	6.97	8.36	3.16	0.58	19.54
1976	5.05	2.67	1.63	6.96	8.60	3.08	0.55	19.95
1977	4.82	2.50	1.66	6.82	8.47	3.19	0.53	19.52
1978	4.90	2.60	1.65	6.76	8.40	3.19	0.53	19.63
1979	4.97	2.79	1.50	6.90	8.40	3.49	0.60	20.24
1980	4.75	2.61	1.03	7.17	8.20	3.68	0.63	19.88
1981	4.55	2.52	0.93	7.13	8.06	3.64	0.64	19.40
1982	4.63	2.61	1.11	5.83	6.94	3.23	0.60	18.00
1983	4.38	2.43	0.98	5.64	6.62	2.91	0.49	16.83
1984	4.56	2.52	1.08	6.15	7.23	3.11	0.53	17.95
1985	4.43	2.43	0.97	5.90	6.87	3.04	0.50	17.28
1986	4.31	2.32	0.92	5.58	6.50	2.60	0.49	16.22
1987	4.32	2.41	1.15	5.89	7.04	2.84	0.52	17.14
1988[4]	4.64	2.67	1.16	6.39	7.55	2.63	0.54	18.04

[1] See Appendix E, Note 11.

[2] Includes deliveries to municipalities and public authorities for institutional heating and other purposes.

[3] Pipeline fuel.

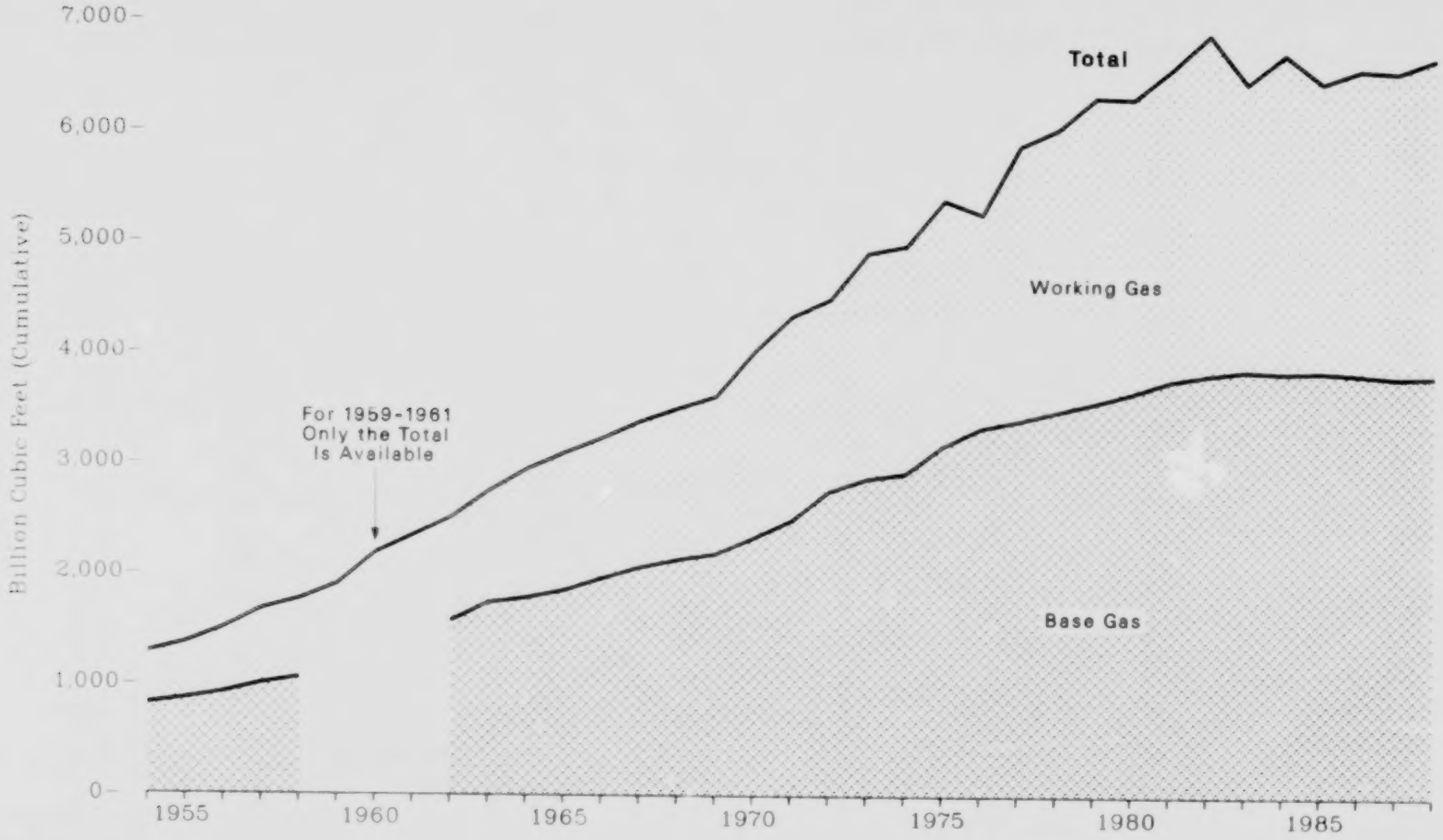
[4] Preliminary.

NA = Not available.

Note: Sum of components may not equal total due to independent rounding. Beginning with 1965, all volumes are shown on a pressure base of 14.73 p.s.i.a. at 60 °F. For prior years, the pressure base is 14.65 p.s.i.a. at 60 °F.

Sources: **Electric Utilities**: •1949 through September 1977—Federal Power Commission, Form 4, "Monthly Power Plant Report." •October 1977 through 1981—Federal Energy Regulatory Commission, FPC Form 4, "Monthly Power Plant Report." •1982 and forward—Energy Information Administration—Form EIA-759, "Monthly Power Plant Report." **All Other Data**: •1949 through 1982—Energy Information Administration, *Natural Gas Annual, 1982*, Appendix B. •1983 through 1987—Energy Information Administration, *Natural Gas Annual*. •1988—Energy Information Administration, *Natural Gas Monthly* January 1989 (March 1989).

Figure 73. Underground Storage of Natural Gas, End of Year 1954-1988



Source: See Table 73

Table 73. Underground Storage of Natural Gas, End of Year 1954-1988

(Billion Cubic Feet)

Year	Base Gas [1]	Working Gas	Total Gas in Storage [1]
1954	817	465	1,281
1955	863	505	1,368
1956	919	583	1,502
1957	1,001	673	1,674
1958	1,056	708	1,764
1959	NA	NA	1,901
1960	NA	NA	2,184
1961	NA	NA	2,344
1962	1,571	933	2,504
1963	1,738	1,007	2,745
1964	1,781	1,159	2,940
1965	1,848	1,242	3,090
1966	1,958	1,267	3,225
1967	2,058	1,318	3,376
1968	2,128	1,366	3,495
1969	2,181	1,421	3,602
1970	2,326	1,678	4,004
1971	2,485	1,840	4,325
1972	2,751	1,729	4,480
1973	2,864	2,034	4,898
1974	2,912	2,050	4,962
1975	3,162	2,212	5,374
1976	3,323	1,926	5,250
1977	3,391	2,475	5,866
1978	3,473	2,547	6,020
1979	3,553	2,753	6,306
1980	3,642	2,655	6,297
1981	3,752	2,817	6,569
1982	3,808	3,071	6,879
1983	3,847	2,595	6,442
1984	3,830	2,876	6,706
1985	3,842	2,607	6,448
1986	3,819	2,749	6,567
1987	3,792	2,756	6,548
1988	3,800	2,871	6,672

[1] Includes native gas.

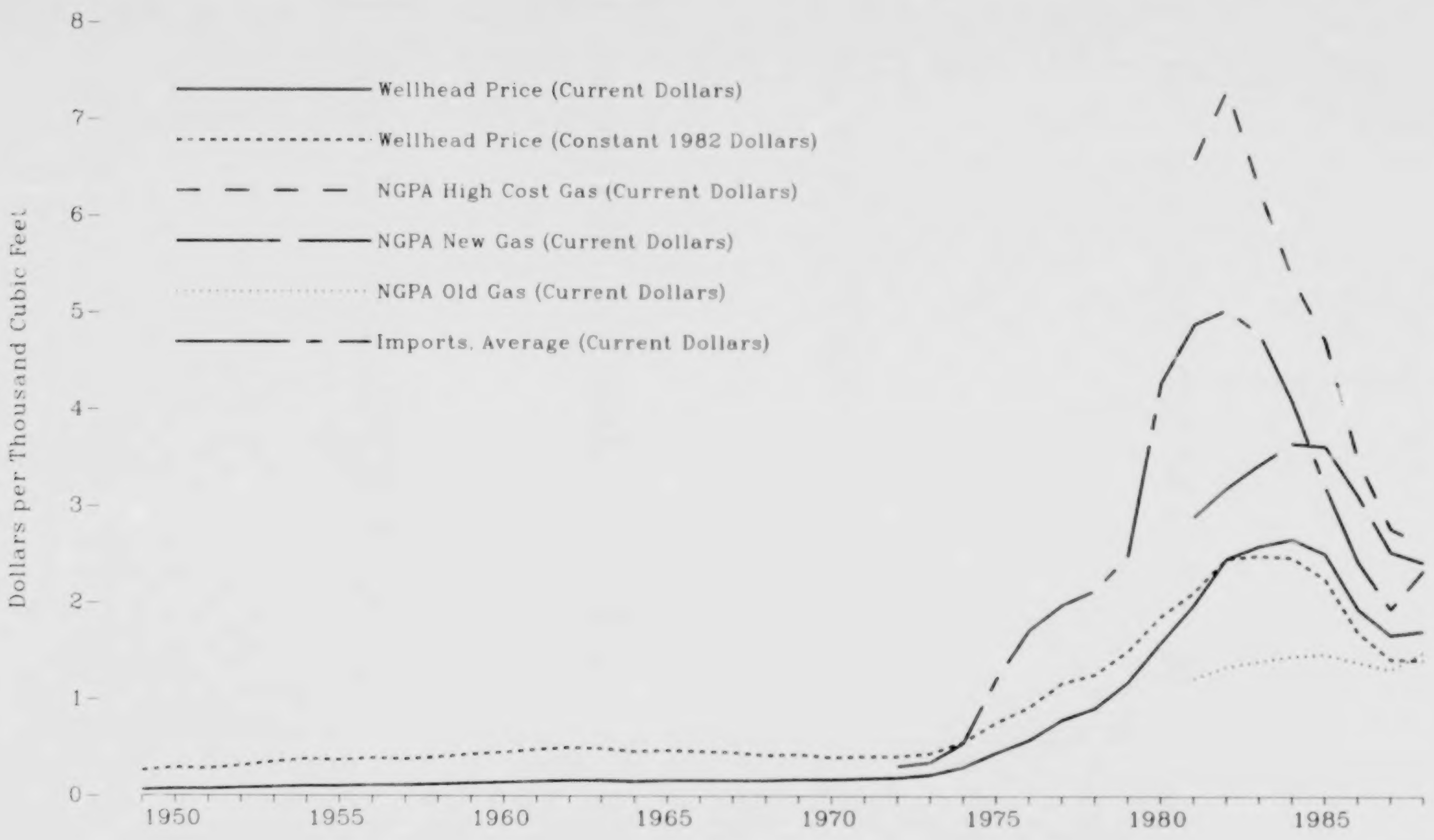
NA = Not available.

Note: Sum of components may not equal total due to independent rounding.

Note: Beginning with 1965 data, all volumes are shown on a pressure base of 14.73 p.s.i.a. at 60 °F. For prior years, the pressure base is 14.65 p.s.i.a. at 60 °F.

Sources: •1954 through 1974—American Gas Association, *Gas Facts*. •1975 and 1976—Federal Energy Administration, Form G 318-M-O and Federal Power Commission, Form 8, "Underground Gas Storage Report." •1977 through 1978— Energy Information Administration, and Federal Energy Administration, Form G 318-M-O and Federal Power Commission, Form 8, "Underground Gas Storage Report." •1979 and forward—Energy Information Administration, EIA Form 191 and Federal Energy Regulatory Commission, FPC Form 8, "Underground Gas Storage Report."

Figure 74. Natural Gas Wellhead and Import Prices, 1949-1988



Source: See Table 74.

Table 74. Natural Gas Wellhead and Import Prices, 1949-1988

(Dollars per Thousand Cubic Feet)

Year	Wellhead[2]		Purchases by NGPA Categories[1]			Imports		
	Wellhead[2]		Old Gas	New Gas	High-Cost Gas	Pipeline	Other[3]	Average
	Current	Constant[4]	Current	Current	Current	Current	Current	Current
1949	0.06	0.26	—	—	—	NA	NA	NA
1950	0.07	0.29	—	—	—	NA	NA	NA
1951	0.07	0.28	—	—	—	NA	NA	NA
1952	0.08	0.31	—	—	—	NA	NA	NA
1953	0.09	0.35	—	—	—	NA	NA	NA
1954	0.10	0.38	—	—	—	NA	NA	NA
1955	0.10	0.37	—	—	—	NA	NA	NA
1956	0.11	0.39	—	—	—	NA	NA	NA
1957	0.11	0.38	—	—	—	NA	NA	NA
1958	0.12	0.40	—	—	—	NA	NA	NA
1959	0.13	0.43	—	—	—	NA	NA	NA
1960	0.14	0.45	—	—	—	NA	NA	NA
1961	0.15	0.48	—	—	—	NA	NA	NA
1962	0.16	0.50	—	—	—	NA	NA	NA
1963	0.16	0.49	—	—	—	NA	NA	NA
1964	0.15	0.46	—	—	—	NA	NA	NA
1965	0.16	0.47	—	—	—	NA	NA	NA
1966	0.16	0.46	—	—	—	NA	NA	NA
1967	0.16	0.45	—	—	—	NA	NA	NA
1968	0.16	0.42	—	—	—	NA	NA	NA
1969	0.17	0.43	—	—	—	NA	NA	NA
1970	0.17	0.40	—	—	—	NA	NA	NA
1971	0.18	0.41	—	—	—	NA	NA	NA
1972	0.19	0.41	—	—	—	0.31	1.38	0.31
1973	0.22	0.44	—	—	—	0.35	1.05	0.35
1974	0.30	0.56	—	—	—	0.55	(5)	0.55
1975	0.44	0.74	—	—	—	1.21	0.74	1.21
1976	0.58	0.92	—	—	—	1.73	0.77	1.72
1977	0.79	1.17	—	—	—	1.99	1.07	1.98
1978	0.91	1.26	—	—	—	2.19	1.53	2.13
1979	1.18	1.50	—	—	—	2.61	2.03	2.49
1980	1.59	1.86	—	—	—	4.33	3.77	4.28
1981	1.98	2.11	1.22	2.89	6.58	4.85	5.54	4.88
1982	2.46	2.46	1.34	3.19	7.31	4.98	5.82	5.03
1983	2.59	2.49	1.40	3.43	6.25	4.51	6.41	4.78
1984	2.66	2.47	1.45	3.65	5.35	4.04	4.90	4.08
1985	2.51	2.26	1.47	3.62	4.71	3.17	4.60	3.21
1986	1.94	1.70	1.39	3.11	3.48	2.42	4.62	2.43
1987	1.67	1.42	1.31	2.53	2.77	1.94	(5)	1.94
1988[e]	1.71	1.41	1.49	2.42	2.61	2.34	2.70	2.34

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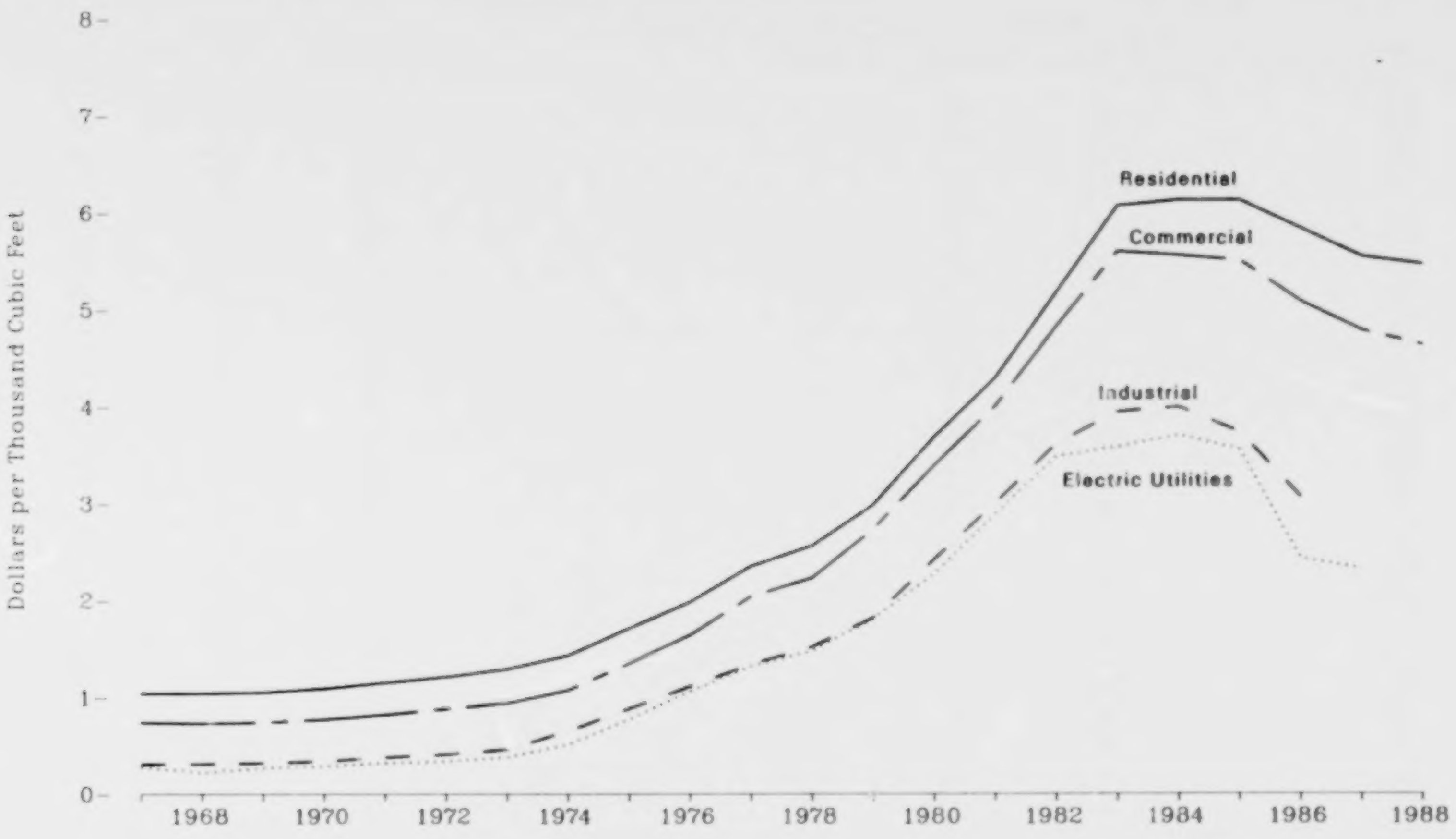
[1] Projected natural gas wellhead purchase prices by major interstate pipeline companies by National Gas Policy Act of 1978 categories (see Appendix E, Note 12). [2] See Glossary for definition of Natural Gas Wellhead Price. [3] Primarily liquefied natural gas from Algeria. [4] In 1982 dollars, calculated using implicit GNP price deflators. See Appendix C. [5] Not applicable. All imports were by pipeline. [e] Estimated. — = Not applicable. NA = Not available. Sources: **Wellhead:** •1949 through 1975—Bureau of Mines, *Minerals Yearbook*, "Natural Gas" chapter. •1976 through 1978—Energy Information Administration, Energy Data Reports, *Natural Gas, Annual*. •1979—Energy Information Administration, *Natural Gas Production and Consumption 1979*. •1980 through 1987—Energy Information Administration, *Natural Gas Annual*. •1988—Energy Information Administration, *Natural Gas Monthly*. **Purchases by NGPA Categories:** • 1981 and forward—Energy Information Administration, *Natural Gas Monthly*. **Imports:** • 1972 and 1973—Federal Power Commission, *Pipeline Imports and Exports of Natural Gas - Imports and Exports of LNG*. •1974 through 1976—Federal Power Commission, *United States Imports and Exports of Natural Gas*, annual. •1977 through 1987—Energy Information Administration, *Natural Gas Monthly* July 1988 (September 1988). •1988—Energy Information Administration estimate.

Figure 75. Average Price of Natural Gas Consumed by End-Use Sector, 1967-1988



Source: See Table 75.

Table 75. Average Price of Natural Gas [1] Consumed by End-Use Sector, 1967-1988

(Dollars per Thousand Cubic Feet)

Year	Residential	Commercial [2]	Industrial: Lease and Plant Fuel	Industrial: Other Industrial	Industrial: Total Industrial	Electric Utilities	Trans-portation [3]	Average
1967	1.04	0.74	0.15	0.34	0.31	0.28	0.20	0.53
1968	1.04	0.73	0.16	0.34	0.31	0.22	0.20	0.51
1969	1.05	0.74	0.18	0.35	0.32	0.27	0.21	0.53
1970	1.09	0.77	0.18	0.37	0.34	0.29	0.21	0.55
1971	1.15	0.82	0.19	0.41	0.38	0.32	0.22	0.59
1972	1.21	0.88	0.20	0.45	0.41	0.34	0.23	0.63
1973	1.29	0.94	0.21	0.50	0.46	0.38	0.25	0.68
1974	1.43	1.07	0.51	0.67	0.65	0.51	0.30	0.84
1975	1.71	1.35	0.47	0.96	0.88	0.77	0.40	1.12
1976	1.98	1.64	0.57	1.24	1.11	1.06	0.51	1.38
1977	2.35	2.04	0.71	1.50	1.34	1.32	0.77	1.66
1978	2.56	2.23	0.79	1.70	1.52	1.48	0.90	1.85
1979	2.98	2.73	1.06	1.99	1.82	1.81	1.32	2.21
1980	3.68	3.39	1.43	2.56	2.42	2.27	1.85	2.80
1981	4.29	4.00	1.93	3.14	3.00	2.89	2.39	3.39
1982	5.17	4.82	2.23	3.87	3.61	3.48	2.97	4.15
1983	6.06	5.59	2.54	4.18	3.94	3.58	3.15	4.64
1984	6.12	5.55	2.71	4.22	3.99	3.70	3.04	4.67
1985	6.12	5.50	2.37	3.95	3.73	3.55	2.92	4.54
1986	5.83	5.08	2.02	3.23	3.06	2.43	2.52	3.97
1987	5.54	4.78	NA	2.94	NA	2.32	2.17	NA
1988[4]	5.46	4.63	NA	2.96	NA	NA	NA	NA

[1] Dry natural gas including supplemental gaseous fuels.

[2] Includes deliveries to municipalities and public authorities for institutional heating and other purposes.

[3] Pipeline fuel.

[4] Preliminary.

NA = Not available.

Note: The average for each end-use sector is calculated by dividing the total value of the gas consumed by each sector by the total quantity consumed. See Appendix E, Note 11.

Sources: **Electric Utilities:** •1967 through 1972 —Federal Power Commission, Form 4, "Monthly Power Plant Report." •1973 through 1976—Federal Power Commission, FPC Form 4, "Monthly Power Plant Report" and FPC Form 423, " Monthly Report of Cost and Quality of Fuels for Electric Plants." •1977—Federal Energy Regulatory Commission, FPC Form 4, "Monthly Power Plant Report" and FPC Form 423, "Monthly Report of Cost and Quality of Fuels for Electric Plants." •1978 through 1982—Energy Information Administration, FPC Form 4, "Monthly Power Plant Report" and FPC Form 423, "Monthly Report of Cost and Quality of Fuels for Electric Plants." •1983 and forward—Energy Information Administration, *Electric Power Annual*. All **Other Data:** •1967 through 1975—Bureau of Mines, *Minerals Yearbook*, "Natural Gas" chapter. •1976 through 1978—Energy Information Administration, Energy Data Reports, *Natural Gas Annual*. •1979—Energy Information Administration, *Natural Gas Production and Consumption 1979*. •1980 and forward—Energy Information Administration, *Natural Gas Annual*.

7. Coal

Prices

In 1975, the average real price[1] of bituminous coal and lignite at the minemouth peaked at $32.43 per short ton, and the average real price of anthracite peaked at $54.40 per short ton (83).[2] After 1975, both prices declined, falling to $18.08 per short ton of bituminous coal and lignite and to $34.51 per short ton of anthracite in 1988.

The average real price of coal delivered to electric utilities declined during the 1950's and 1960's (83). However, when prices of other fossil fuels rose rapidly after 1973, coal prices also increased, from $18.20 per short ton in 1973 to $28.63 per short ton the following year. (Despite that increase, coal remained the least expensive fossil fuel, on a Btu basis.) The price of coal gradually rose after 1974, peaking at $34.90 per short ton in 1982, and then declined each year through 1988, by which time the price had fallen to $25.14.

The average real price of coal coke consumed at blast furnaces also reached its highest level—$141.70 per short ton—in 1975, and then gradually declined to $91.22 per short ton in 1985 (the most recent year for which data are available).

Changing Patterns of Coal Production

Bituminous coal accounts for by far the largest share of all coal production. In 1988, production of all types of coal totaled 959 million short tons, of which 869 million were bituminous and subbituminous coal (77). Lignite and anthracite accounted for the remainder. Despite its superior burning qualities, anthracite, mined in northeastern Pennsylvania, accounts for a diminishing share of total coal production. In 1950, anthracite accounted for 8 percent of the total; by 1988, its share had shrunk to less than one-half of 1 percent.

More coal is mined east of the Mississippi than in the West, but the West's share of total production increased almost every year after 1968. That year, production of western coal was 30 million shorts tons, 5 percent of the total. By 1988, western production had increased by more than 12 times, to 368 million short tons—38 percent of the total. The growth in western coal was due in part to environmental concerns that led to increased demand for low-sulfur coal, which is concentrated in the West. In addition, surface mining, with its higher average productivity, is much more prevalent in the West.

The Peak in Productivity

The average productivity of all types of mines in the United States increased each year after 1949, reaching 2.4 short tons per miner hour in 1969 (81). Productivity during the 1970's and early 1980's was lower, primarily due to the coal industry's compliance with the Federal Coal Mine Health and Safety Act of 1969, as well as to environmental concerns and other factors.

The growing importance of surface coal mining, where productivity is generally higher than for underground mining, led to increases in average productivity during the mid-1980's. In 1987, average productivity reached an all-time high of 3.3 short tons per miner hour. That year, productivity of underground mines (excluding anthracite) was 2.2 short tons per miner hour and productivity of surface mines (excluding anthracite) was 5.1 short tons per miner hour.

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[1] Real prices are expressed in constant 1982 dollars.

[2] Numbers in parentheses indicate related tables. Annual data are the most recent available and frequently are preliminary.

Domestic Markets: Changes in Coal End Use

Electric utilities are the dominant consumers of coal (78). Their consumption grew from 84 million short tons, a 17-percent share, in 1949, to 757 million short tons, an 86-percent share, in 1988.

In contrast, consumption by all other economic sectors in 1988 was lower than it had been in 1949. The most dramatic declines occurred in the transportation sector, where railroads switched to petroleum, and the residential and commercial sector. In 1949, those two sectors accounted for 187 million short tons, 39 percent of total coal consumption. By 1988, their consumption totaled 8 million short tons, less than 1 percent of U.S. consumption.

Consumption by the industrial sector, including coke plants, trended downward after the mid-1960's. From 205 million short tons in 1966, industrial consumption fell to about 112 million short tons in 1986 and 1987. In 1988, growth in manufacturing activity was accompanied by a modest increase in industrial consumption, which rose 4 percent to 117 million short tons for the year.

Foreign Markets

Since World War II, coal has been the United States' major energy export (5). Throughout most of the 1960's and 1970's, U.S. exports of coal increased, peaking at 113 million shorts tons in 1981 (79). Increased shipments to Canada and Japan and to European markets contributed to the growth.

The level of U.S. coal exports fluctuated throughout the 1980's, falling as low as 78 million short tons in 1983 but attaining 95 million short tons in 1988. That year, difficulties experienced by competing countries (particularly China, Australia, and Poland) allowed the United States to recapture some export markets.

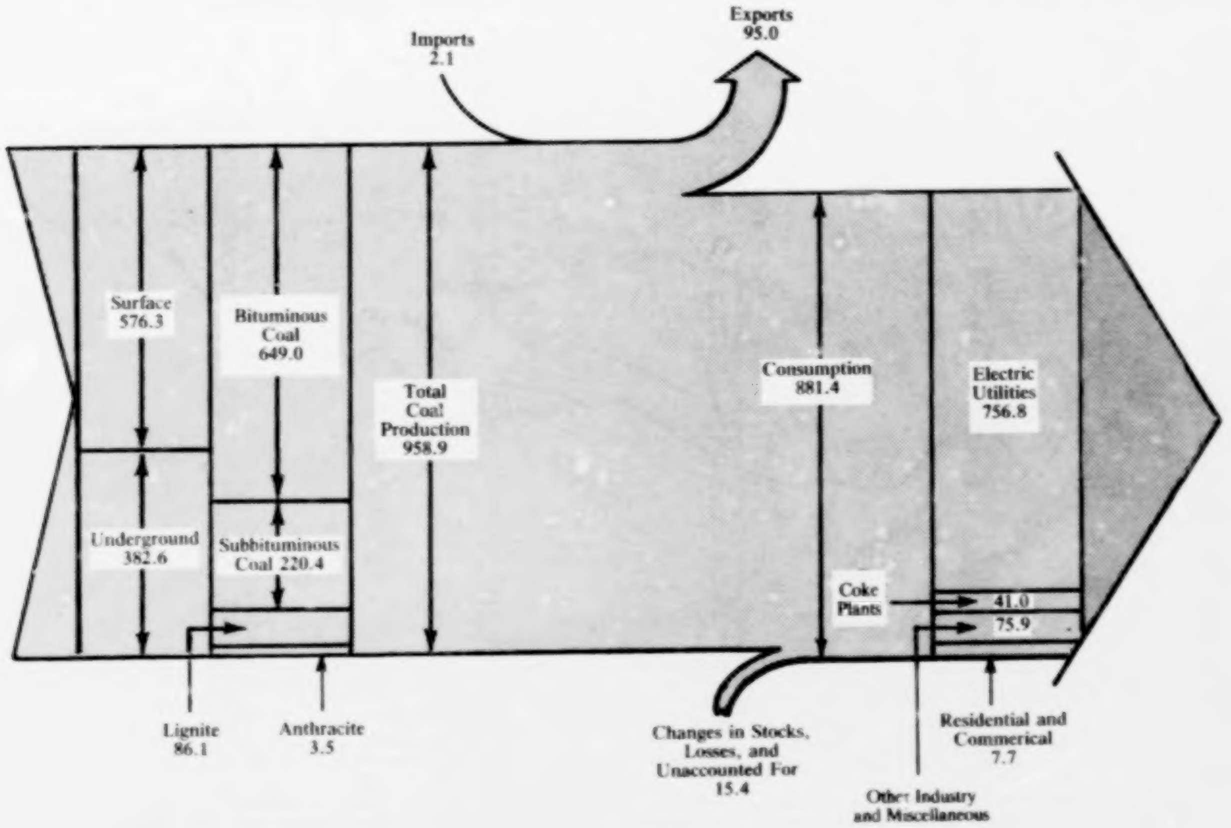
Canada, Japan, and Italy remained the three largest markets for U.S. coal and together accounted for 47 percent of total exports in 1988. However, Japan's 1988 purchases were not much more than half those of 1981, and U.S. exports to France, West Germany, Spain, and Denmark also were down markedly compared with 1981 levels.

Stocks

Although there is little seasonal variation in demand, production of coal can vary considerably due to factors such as coal miners' strikes and bad weather. To compensate for possible supply interruptions, coal producers and distributors, as well as major consumers such as electric utilities and coke plants, generally maintain large stockpiles. For example, in 1980 coal stocks were built up to a year-end total of 228 million short tons (80) and then drawn down to augment supplies during the 1981 miners' strike. Despite stockpiling during the second half of the year, after the strike had ended, 1981 year-end stocks totaled 209 million short tons, 19 million short tons below the level at the end of the previous year.

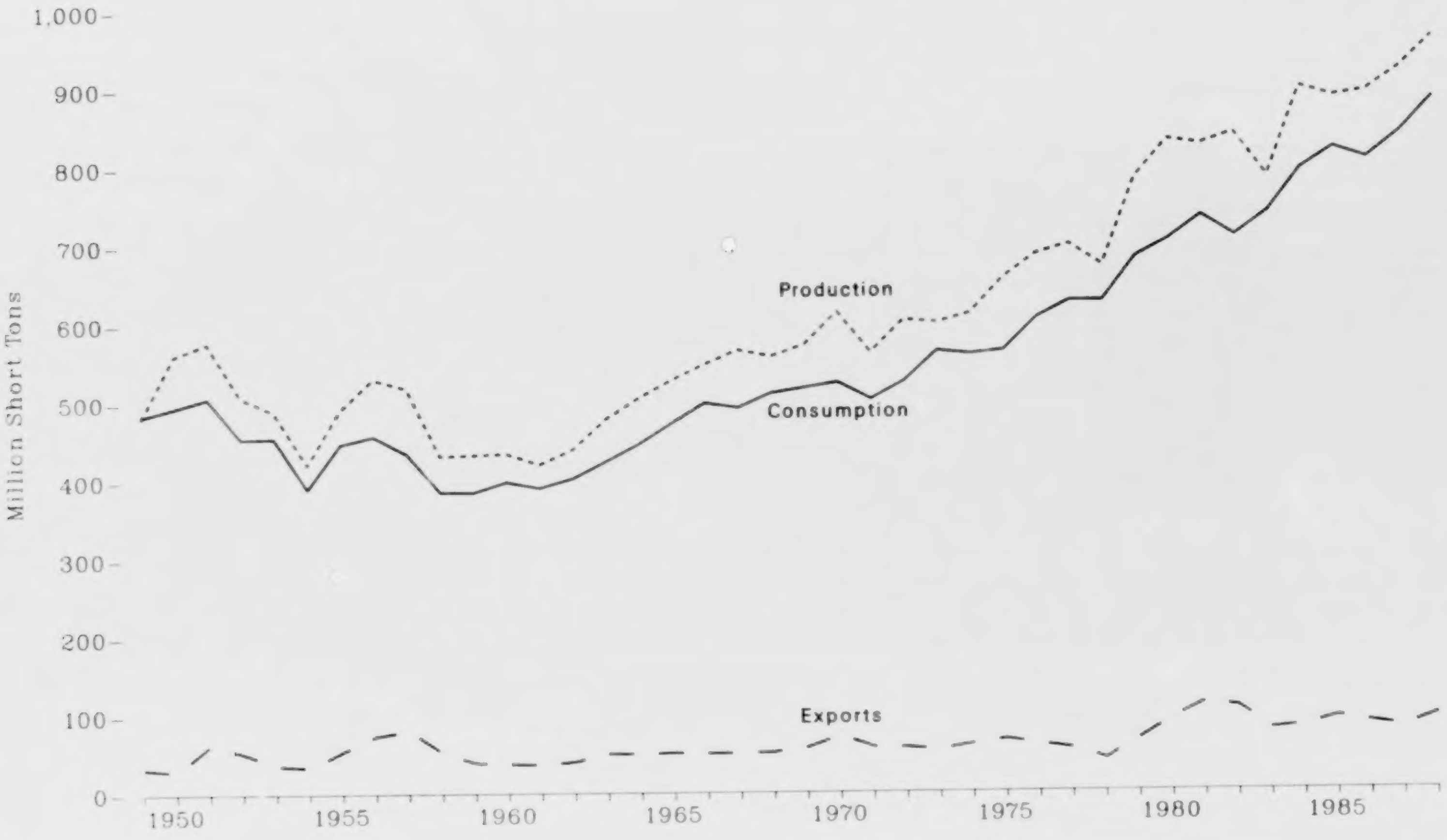
At the end of 1988, coal stocks totaled 190 million short tons. Electric utilities held over three-fourths of the coal, and coal producers and distributors held most of the remainder. Stocks at coke plants and other industrial sites were relatively small.

Diagram 4. Coal Flow, 1988
(Million Short Tons)


Imports
2.1
Exports
95.0
Surface
576.3
Underground
382.6
Bituminous
Coal
649.0
Subbituminous
Coal 220.4
Total
Coal
Production
958.9
Consumption
881.4
Electric
Utilities
756.8
Coke
Plants
41.0
75.9
Lignite
86.1
Anthracite
3.5
Changes in Stocks,
Losses, and
Unaccounted For
15.4
Residential and
Commerical
7.7
Other Industry
and Miscellaneous

Note: Sum of components may not equal total due to independent rounding.
Sources: See Tables 76, 77, and 78.

Figure 76. Coal Overview, 1949-1988



Source: See Table 76.

Table 76. Coal Overview, 1949-1988

(Million Short Tons)

Year	Production	Imports	Exports	Stock Changes, Losses, and Unaccounted for [1]	Consumption
1949	480.6	0.3	32.8	35.1	483.2
1950	560.4	0.4	29.4	-37.3	494.1
1951	576.3	0.3	62.7	-8.1	505.9
1952	507.4	0.3	52.2	-1.4	454.1
1953	488.2	0.3	36.5	2.8	454.8
1954	420.8	0.2	33.9	2.8	389.9
1955	490.8	0.3	54.4	10.3	447.0
1956	529.8	0.4	73.8	0.5	456.9
1957	518.0	0.4	80.8	-3.2	434.5
1958	431.6	0.3	52.6	6.4	385.7
1959	432.7	0.4	39.0	-9.0	385.1
1960	434.3	0.3	38.0	1.5	398.1
1961	420.4	0.2	36.4	6.2	390.4
1962	439.0	0.2	40.2	3.2	402.3
1963	477.2	0.3	50.4	-3.6	423.5
1964	504.2	0.3	49.5	-9.3	445.7
1965	527.0	0.2	51.0	-4.1	472.0
1966	546.8	0.2	50.1	0.8	497.7
1967	564.9	0.2	50.1	-23.6	491.4
1968	556.7	0.2	51.2	4.1	509.8
1969	571.0	0.1	56.9	2.2	516.4
1970	612.7	([2])	71.7	-17.7	523.2
1971	560.9	0.1	57.3	-2.2	501.6
1972	602.5	([2])	56.7	-21.5	524.3
1973	598.6	0.1	53.6	17.5	562.6
1974	610.0	2.1	60.7	7.0	558.4
1975	654.6	0.9	66.3	-26.6	562.6
1976	684.9	1.2	60.0	-22.3	603.8
1977	697.2	1.6	54.3	-19.2	625.3
1978	670.2	3.0	40.7	-7.2	625.2
1979	781.1	2.1	66.0	-36.6	680.5
1980	829.7	1.2	91.7	-36.4	702.7
1981	823.8	1.0	112.5	20.4	732.6
1982	838.1	0.7	106.3	-25.7	706.9
1983	782.1	1.3	77.8	31.1	736.7
1984	895.9	1.3	81.5	-24.4	791.3
1985	883.6	2.0	92.7	25.1	818.0
1986	890.3	2.2	85.5	-2.7	804.3
1987	918.8	1.7	79.6	-4.0	836.9
1988[3]	958.9	2.1	95.0	15.4	881.4

[1] Includes changes in stocks at electric utilities, coke plants, other industries, retail dealers, and producers/distributors and the balancing item of losses and unaccounted for.

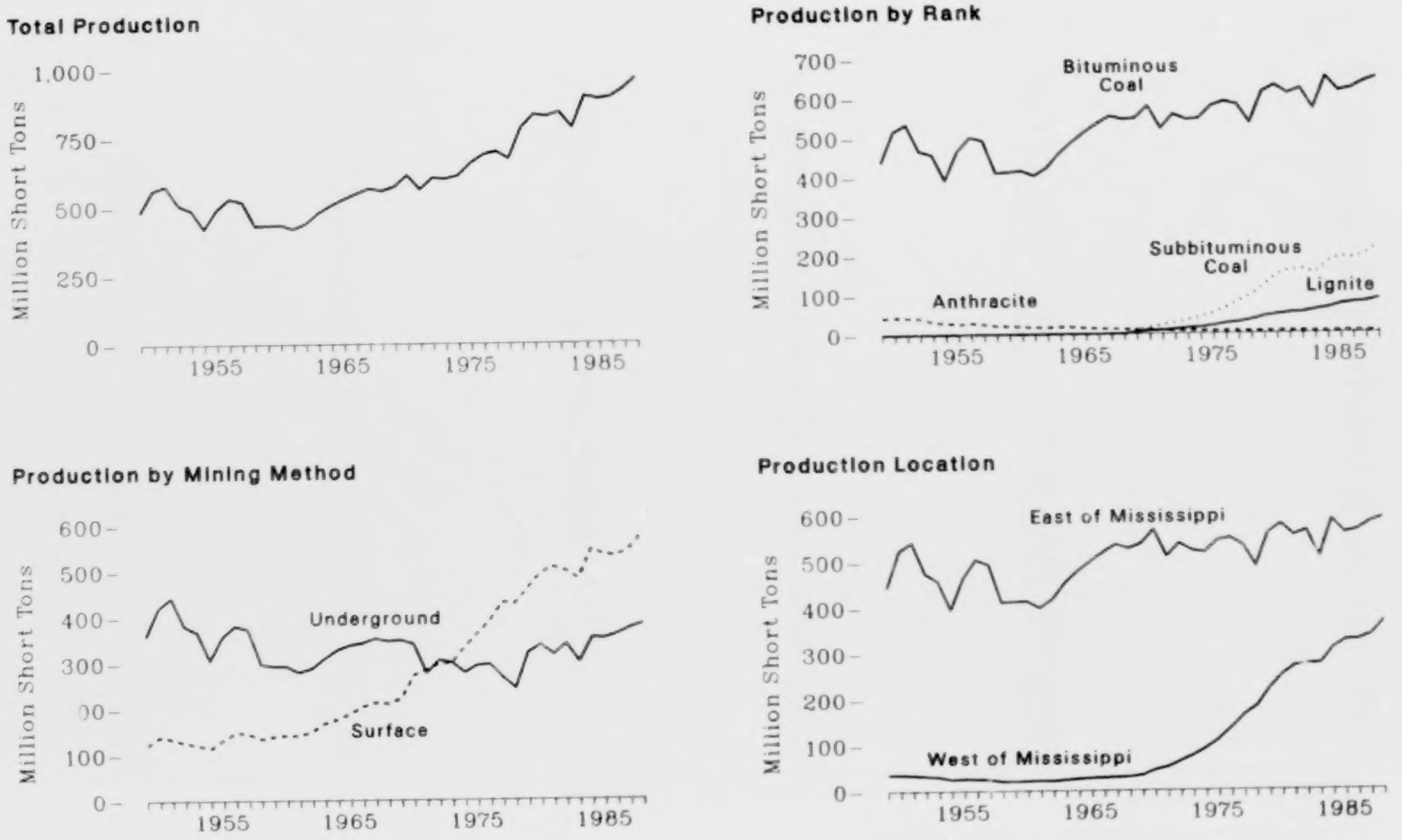
[2] Less than 0.05 million short tons.

[3] Preliminary.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1949 through 1975—Bureau of Mines, *Minerals Yearbook*, "Coal-Bituminous and Lignite" and "Coal-Pennsylvania Anthracite" chapters. •1976—Energy Information Administration, Energy Data Report, *Coal-Bituminous and Lignite in 1976* and *Coal-Pennsylvania Anthracite 1976*. •1977 and 1978—Energy Information Administration, Energy Data Reports, *Bituminous Coal and Lignite Production and Mine Operations-1977;....1978* and *Coal-Pennsylvania Anthracite 1977;....1978*. • 1979 through 1980—Energy Information Administration, Energy Data Report, *Weekly Coal Report*. •1981 and forward—Energy Information Administration, *Weekly Coal Production*.

Figure 77. Coal Production, 1949-1988



Total Production

Production by Rank

Production by Mining Method

Production Location

Source: See Table 77.

Table 77. Coal Production, 1949-1988

(Million Short Tons)

Year	Rank				Mining Method		Location		Total
	Bituminous Coal	Subbituminous Coal	Lignite	Anthracite	Underground	Surface	West of the Mississippi	East of the Mississippi	
1949	437.9	(1)	(1)	42.7	358.9	121.7	36.4	444.2	480.6
1950	516.3	(1)	(1)	44.1	421.0	139.4	36.0	524.4	560.4
1951	533.7	(1)	(1)	42.7	442.2	134.2	34.6	541.7	576.3
1952	466.8	(1)	(1)	40.6	381.2	126.3	32.7	474.8	507.4
1953	457.3	(1)	(1)	30.9	367.4	120.8	30.6	457.7	488.2
1954	391.7	(1)	(1)	29.1	306.0	114.8	25.4	395.4	420.8
1955	464.6	(1)	(1)	26.2	358.0	132.9	26.6	464.2	490.8
1956	500.9	(1)	(1)	28.9	380.8	148.9	25.8	504.0	529.8
1957	492.7	(1)	(1)	25.3	373.6	144.5	24.7	493.4	518.0
1958	410.4	(1)	(1)	21.2	297.6	134.0	20.3	411.3	431.6
1959	412.0	(1)	(1)	20.6	292.8	139.8	20.3	412.4	432.7
1960	415.5	(1)	(1)	18.8	292.6	141.7	21.3	413.0	434.3
1961	403.0	(1)	(1)	17.4	279.6	140.9	21.8	398.6	420.4
1962	422.1	(1)	(1)	16.9	287.9	151.1	21.4	417.6	439.0
1963	458.9	(1)	(1)	18.3	309.0	168.2	23.7	453.5	477.2
1964	487.0	(1)	(1)	17.2	327.7	176.5	25.7	478.5	504.2
1965	512.1	(1)	(1)	14.9	338.0	189.0	27.4	499.5	527.0
1966	533.9	(1)	(1)	12.9	342.6	204.2	28.0	518.8	546.8
1967	552.6	(1)	(1)	12.3	352.4	212.5	28.9	536.0	564.9
1968	545.2	(1)	(1)	11.5	346.6	210.1	29.7	527.0	556.7
1969	547.2	8.3	5.0	10.5	349.2	221.7	33.3	537.7	571.0
1970	578.5	16.4	8.0	9.7	340.5	272.1	44.9	567.8	612.7
1971	521.3	22.2	8.7	8.7	277.2	283.7	51.0	509.9	560.9
1972	556.8	27.5	11.0	7.1	305.0	297.4	64.3	538.2	602.5
1973	543.5	33.9	14.3	6.8	300.1	298.5	76.4	522.1	598.6
1974	545.7	42.2	15.5	6.6	278.0	332.1	91.9	518.1	610.0
1975	577.5	51.1	19.8	6.2	293.5	361.2	110.9	543.7	654.6
1976	588.4	64.8	25.5	6.2	295.5	389.4	136.1	548.8	684.9
1977	581.0	82.1	28.2	5.9	266.6	430.6	163.9	533.3	697.2
1978	534.0	96.8	34.4	5.0	242.8	427.4	183.0	487.2	670.2
1979	612.3	121.5	42.5	4.8	320.9	460.2	221.4	559.7	781.1
1980	628.8	147.7	47.2	6.1	337.5	492.2	251.0	578.7	829.7
1981	608.0	159.7	50.7	5.4	316.5	507.3	269.9	553.9	823.8
1982	620.2	160.9	52.4	4.6	339.2	499.0	273.9	564.3	838.1
1983	568.6	151.0	58.3	4.1	300.4	481.7	274.7	507.4	782.1
1984	649.5	179.2	63.1	4.2	352.1	543.9	308.3	587.6	895.9
1985	613.9	192.7	72.4	4.7	350.8	532.8	324.9	558.7	883.6
1986	620.1	189.6	76.4	4.3	360.4	529.9	325.9	564.4	890.3
1987	636.6	200.2	78.4	3.6	372.9	545.9	336.8	581.9	918.8
1988[2]	647.9	221.4	86.1	3.5	382.6	576.3	367.6	591.3	958.9

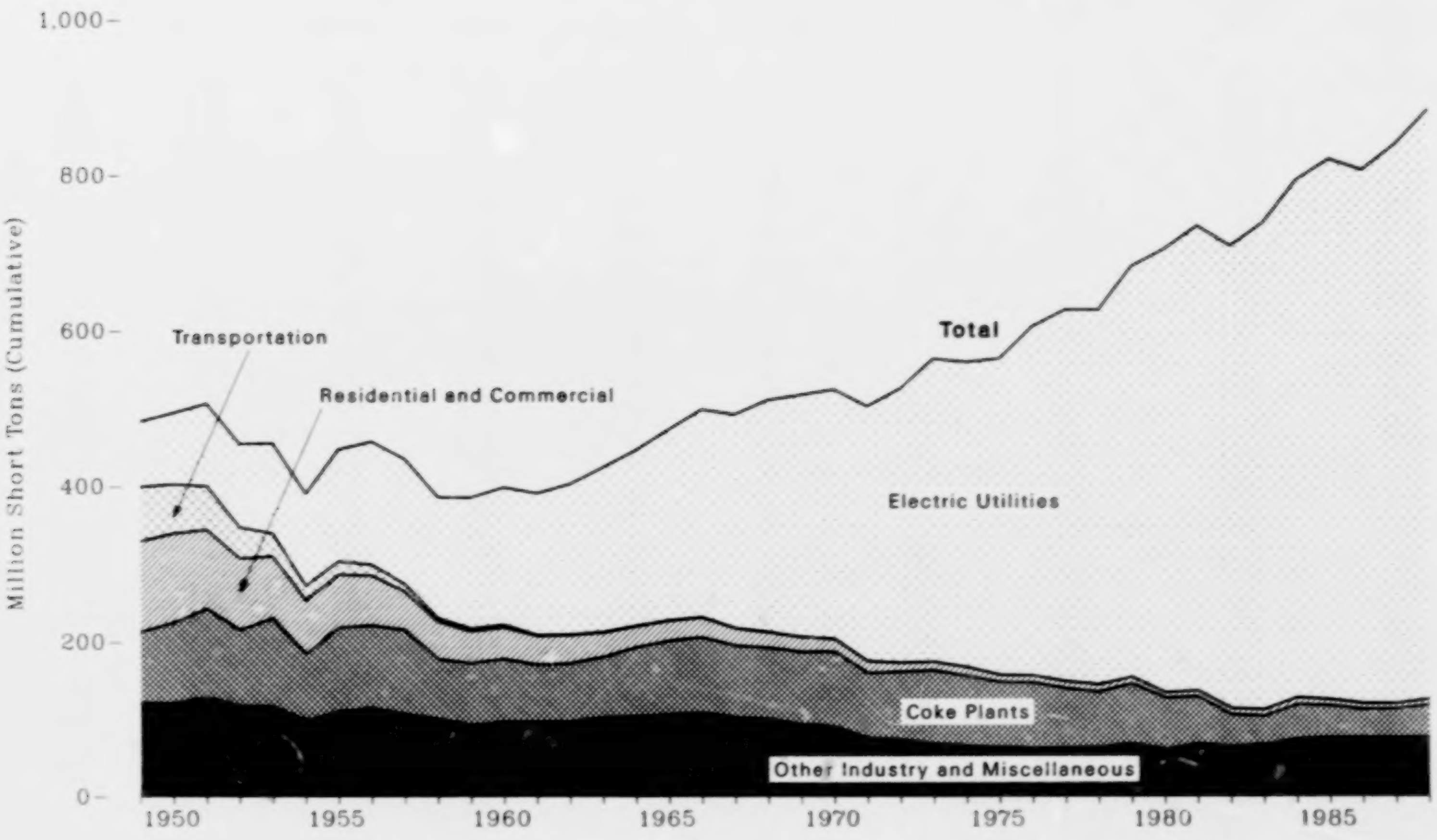
[1] Included in bituminous coal.

[2] Preliminary.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1949 through 1975—Bureau of Mines, *Minerals Yearbook*, "Coal-Bituminous and Lignite" and "Coal-Pennsylvania Anthracite" chapters. •1976—Energy Information Administration, Energy Data Report, *Coal-Bituminous and Lignite in 1976* and *Coal-Pennsylvania Anthracite 1976*. •1977 and 1978—Energy Information Administration, Energy Data Report, *Bituminous Coal and Lignite Production and Mine Operations-1977; ...1978*, *Coal-Pennsylvania Anthracite 1977; ...1978*, and *Coal Production* (annual). •1979 through 1980—Energy Information Administration, Energy Data Report, *Weekly Coal Report* and *Coal Production* (annual). •1981 and forward—Energy Information Administration, *Weekly Coal Production* and *Coal Production* (annual).

Figure 78. Coal Consumption by End-Use Sector, 1949-1988



Source: See Table 78.

Table 78. Coal Consumption by End-Use Sector,[1] 1949-1988

(Million Short Tons)

Year	Electric Utilities	Industry and Miscellaneous: Coke Plants	Industry and Miscellaneous: Other Industry and Miscellaneous	Industry and Miscellaneous: Total	Transportation	Residential and Commercial	Total
1949	84.0	91.4	121.2	212.6	70.2	116.5	483.2
1950	91.9	104.0	120.6	224.6	63.0	114.6	494.1
1951	105.8	113.7	128.7	242.4	56.2	101.5	505.9
1952	107.1	97.8	117.1	214.9	39.8	92.3	454.1
1953	115.9	113.1	117.0	230.1	29.6	79.2	454.8
1954	118.4	85.6	98.2	183.9	18.6	69.1	389.9
1955	143.8	107.7	110.1	217.8	17.0	68.4	447.0
1956	158.3	106.3	114.3	220.6	13.8	64.2	456.9
1957	160.8	108.4	106.5	214.9	9.8	49.0	434.5
1958	155.7	76.8	100.5	177.4	4.7	47.9	385.7
1959	168.4	79.6	92.7	172.3	3.6	40.8	385.1
1960	176.7	81.4	96.0	177.4	3.0	40.9	398.1
1961	182.2	74.2	95.9	170.1	0.8	37.3	390.4
1962	193.3	74.7	97.1	171.7	0.7	36.5	402.3
1963	211.3	78.1	101.9	180.0	0.7	31.5	423.5
1964	225.4	89.2	103.1	192.4	0.7	27.2	445.7
1965	244.8	95.3	105.6	200.8	0.7	25.7	472.0
1966	266.5	96.4	108.7	205.1	0.6	25.6	497.7
1967	274.2	92.8	101.8	194.6	0.5	22.1	491.4
1968	297.8	91.3	100.4	191.6	0.4	20.0	509.8
1969	310.6	93.4	93.1	186.6	0.3	18.9	516.4
1970	320.2	96.5	90.2	186.6	0.3	16.1	523.2
1971	327.3	83.2	75.6	158.9	0.2	15.2	501.6
1972	351.8	87.7	72.9	160.6	0.2	11.7	524.3
1973	389.2	94.1	68.0	162.1	0.1	11.1	562.6
1974	391.8	90.2	64.9	155.1	0.1	11.4	558.4
1975	406.0	83.6	63.6	147.2	(2)	9.4	562.6
1976	448.4	84.7	61.8	146.5	(2)	8.9	603.8
1977	477.1	77.7	61.5	139.2	(2)	9.0	625.3
1978	481.2	71.4	63.1	134.5	(2)	9.5	625.2
1979	527.1	77.4	67.7	145.1	(2)	8.4	680.5
1980	569.3	66.7	60.3	127.0	(2)	6.5	702.7
1981	596.8	61.0	67.4	128.4	(2)	7.4	732.6
1982	593.7	40.9	64.1	105.0	(2)	8.2	706.9
1983	625.2	37.0	66.0	103.0	(2)	8.4	736.7
1984	664.4	44.0	73.7	117.8	(2)	9.1	791.3
1985	693.8	41.1	75.4	116.4	(2)	7.8	818.0
1986	685.1	36.0	75.6	111.6	(2)	7.7	804.3
1987	717.9	37.0	75.2	112.1	(2)	6.9	836.9
1988[3]	756.8	41.0	75.9	116.9	(2)	7.7	881.4

[1] See Appendix E, Note 13.

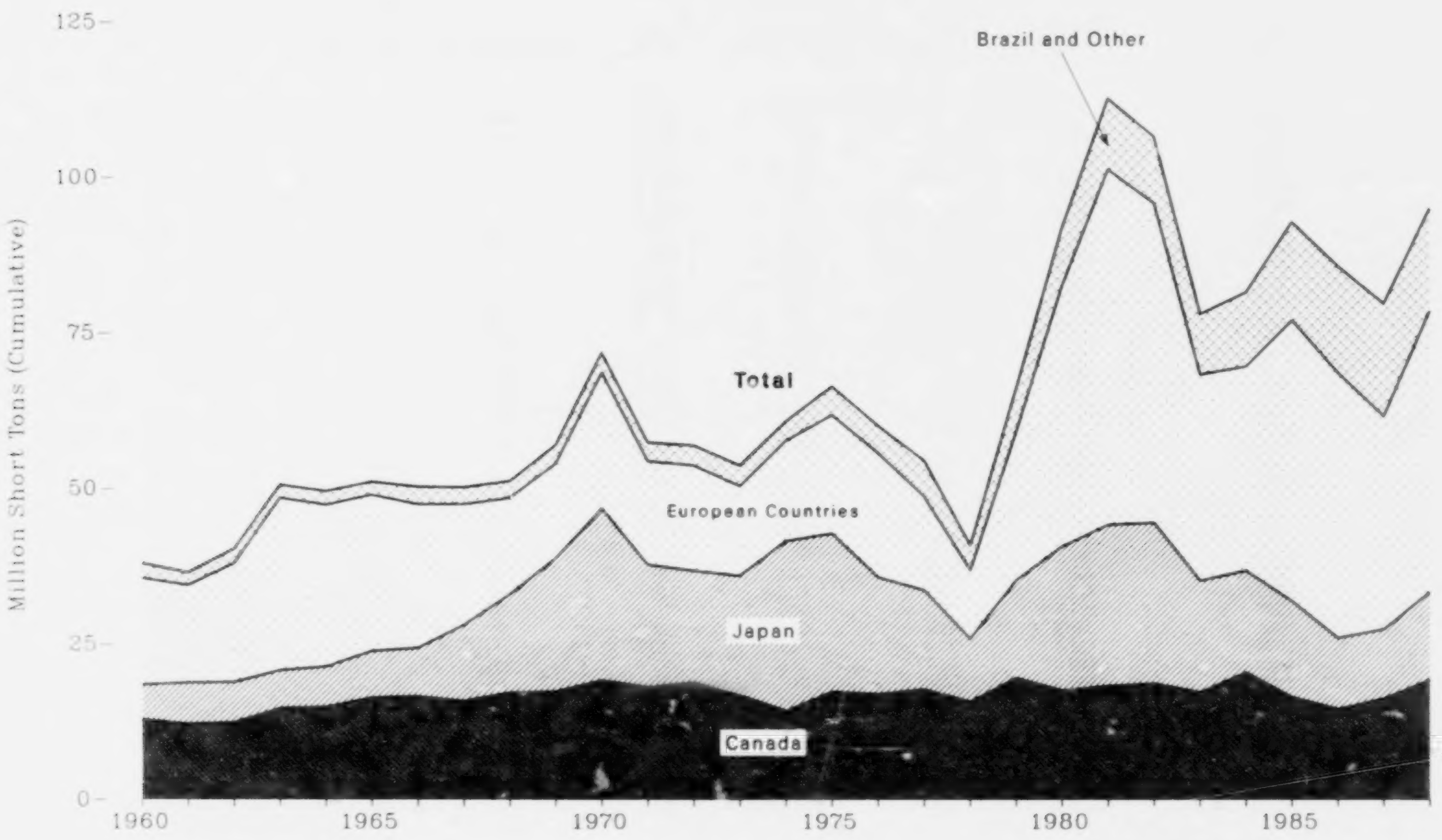
[2] Less than 0.05 million short tons. Quantities are included in the Other Industry and Miscellaneous category.

[3] Preliminary, except for electric utilities which is final.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1949 through 1975—Bureau of Mines, *Minerals Yearbook*, "Coal-Bituminous and Lignite" and "Coal-Pennsylvania Anthracite" chapters. •1976—Energy Information Administration, Energy Data Report, *Coal-Bituminous and Lignite in 1976* and *Coal-Pennsylvania Anthracite 1976*. •1977 and 1978—Energy Information Administration, Energy Data Report, *Coal-Pennsylvania Anthracite 1977; 1978* and *Weekly Coal Report*. • 1979 through 1980—Energy Information Administration, Energy Data Report, *Weekly Coal Report*. •1981—Energy Information Administration, *Weekly Coal Production*. •1982 and forward—Energy Information Administration, *Quarterly Coal Report*.

Figure 79. Coal Exports by Country of Destination, 1960–1988



Source: See Table 79.

Table 79. Coal Exports by Country of Destination, 1960-1988

(Million Short Tons)

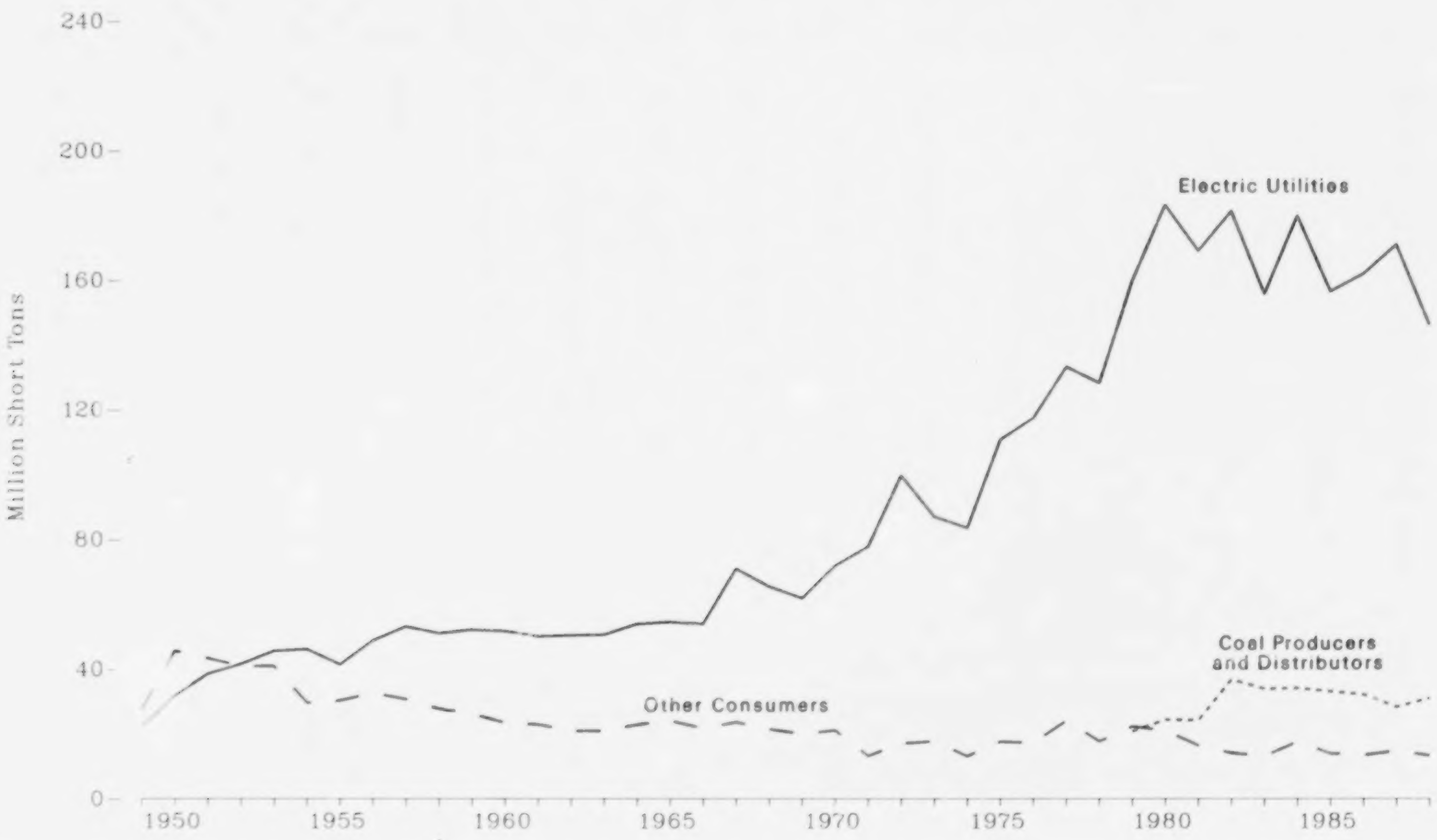
			Europe												
Year	Canada	Brazil	Belgium/ Luxem- bourg	Denmark	France	West Germany	Italy	Nether- lands	Spain	United Kingdom	Other	Total	Japan	Other	Total
1960	12.8	1.1	1.1	0.1	0.8	4.6	4.9	2.8	0.3	0	2.4	17.1	5.6	1.3	38.0
1961	12.1	1.0	1.0	0.1	0.7	4.3	4.8	2.6	0.2	0	2.0	15.7	6.6	1.0	36.4
1962	12.3	1.3	1.3	(1)	0.9	5.1	6.0	3.3	0.8	(1)	1.8	19.1	6.5	1.0	40.2
1963	14.6	1.2	2.7	(1)	2.7	5.6	7.9	5.0	1.5	(1)	2.4	27.7	6.1	0.9	50.4
1964	14.8	1.1	2.3	(1)	2.2	5.2	8.1	4.2	1.4	(1)	2.6	26.0	6.5	1.1	49.5
1965	16.3	1.2	2.2	(1)	2.1	4.7	9.0	3.4	1.4	(1)	2.3	25.1	7.5	0.9	51.0
1966	16.5	1.7	1.8	(1)	1.6	4.9	7.8	3.2	1.2	(1)	2.5	23.1	7.8	1.0	50.1
1967	15.8	1.7	1.4	0	2.1	4.7	5.9	2.2	1.0	0	2.1	19.4	12.2	1.0	50.1
1968	17.1	1.8	1.1	(1)	1.5	3.8	4.3	1.5	1.5	(1)	1.9	15.5	15.8	0.9	51.2
1969	17.3	1.8	0.9	0	2.3	3.5	3.7	1.6	1.8	(1)	1.3	15.2	21.4	1.2	56.9
1970	19.1	2.0	1.9	(1)	3.6	5.0	4.3	2.1	3.2	(1)	1.8	21.8	27.6	1.2	71.7
1971	18.0	1.9	0.8	0	3.2	2.9	2.7	1.6	2.6	1.7	1.1	16.6	19.7	1.1	57.3
1972	18.7	1.9	1.1	(1)	1.7	2.4	3.7	2.3	2.1	2.4	1.1	16.9	18.0	1.2	56.7
1973	16.7	1.6	1.2	0	2.0	1.6	3.3	1.8	2.2	0.9	1.3	14.4	19.2	1.6	53.6
1974	14.2	1.3	1.1	0	2.7	1.5	3.9	2.6	2.0	1.4	0.9	16.1	27.3	1.8	60.7
1975	17.3	2.0	0.6	0	3.6	2.0	4.5	2.1	2.7	1.9	1.6	19.0	25.4	2.6	66.3
1976	16.9	2.2	2.2	(1)	3.5	1.0	4.2	3.5	2.5	0.8	2.1	19.9	18.8	2.1	60.0
1977	17.7	2.3	1.5	0.1	2.1	0.9	4.1	2.0	1.6	0.6	2.1	15.0	15.9	3.5	54.3
1978	15.7	1.5	1.1	0	1.7	0.6	3.2	1.1	0.8	0.4	2.2	11.0	10.1	2.5	40.7
1979	19.5	2.8	3.2	0.2	3.9	2.6	5.0	2.0	1.4	1.4	4.4	23.9	15.7	4.1	66.0
1980	17.5	3.3	4.6	1.7	7.8	2.5	7.1	4.7	3.4	4.1	6.0	41.9	23.1	6.0	91.7
1981	18.2	2.7	4.3	3.9	9.7	4.3	10.5	6.8	6.4	2.3	8.8	57.0	25.9	8.7	112.5
1982	18.6	3.1	4.8	2.8	9.0	2.3	11.3	5.9	5.6	2.0	7.6	51.3	25.8	7.5	106.3
1983	17.2	3.6	2.5	1.7	4.2	1.5	8.1	4.2	3.3	1.2	6.4	33.1	17.9	6.1	77.8
1984	20.4	4.7	3.9	0.6	3.8	0.9	7.6	5.5	2.3	2.9	5.3	32.8	16.3	7.2	81.5
1985	16.4	5.9	4.4	2.2	4.5	1.1	10.3	6.3	3.5	2.7	10.3	45.1	15.4	9.9	92.7
1986	14.5	5.7	4.4	2.1	5.4	0.8	10.4	5.6	2.6	2.9	8.4	42.6	11.4	11.4	85.5
1987	16.2	5.8	4.6	0.9	2.9	0.5	9.5	4.1	2.5	2.6	6.6	34.2	11.1	12.3	79.6
1988	19.2	5.3	6.5	2.8	4.3	0.7	11.1	5.1	2.5	3.7	8.5	45.1	14.1	11.3	95.0

[1] Less than 50,000 tons.

Note: Sum of components may not equal total due to independent rounding.

Source: Bureau of the Census, *U.S. Exports by Schedule B Commodities*, EM 522.

Figure 80. Coal Stocks, End of Year 1949–1988



Source: See Table 80.

Table 80. Coal Stocks, End of Year 1949-1988

(Million Short Tons)

Year	Coal Consumers					Coal Producers and Distributors	Total
	Electric Utilities	Coke Plants	Other Industry [1]	Residential [2] and Commercial	Total		
1949	22.1	10.0	16.1	1.4	49.5	NA	NA
1950	31.8	16.8	26.2	2.5	77.3	NA	NA
1951	38.5	15.3	26.2	1.8	81.8	NA	NA
1952	41.5	14.5	24.7	1.7	82.4	NA	NA
1953	45.6	16.6	22.8	1.5	86.6	NA	NA
1954	46.1	12.4	16.4	0.8	75.7	NA	NA
1955	41.4	13.4	15.9	1.0	71.7	NA	NA
1956	48.8	14.0	17.4	1.1	81.3	NA	NA
1957	53.1	14.2	15.5	0.9	83.7	NA	NA
1958	51.0	13.1	13.7	0.9	78.7	NA	NA
1959	52.1	11.6	13.6	1.0	78.4	NA	NA
1960	51.7	11.1	11.6	0.7	75.2	NA	NA
1961	50.1	10.5	11.9	0.5	73.0	NA	NA
1962	50.4	8.4	12.0	0.5	71.3	NA	NA
1963	50.6	8.1	12.3	0.5	71.5	NA	NA
1964	53.9	10.2	12.2	0.4	76.7	NA	NA
1965	54.5	10.6	13.1	0.4	78.6	NA	NA
1966	53.9	9.3	12.2	0.2	75.6	NA	NA
1967	71.0	11.1	12.3	0.2	94.6	NA	NA
1968	65.5	9.7	11.7	0.2	87.0	NA	NA
1969	61.9	9.1	10.8	0.2	81.9	NA	NA
1970	71.9	9.0	11.8	0.3	93.0	NA	NA
1971	77.8	7.3	5.6	0.3	91.0	NA	NA
1972	99.7	9.1	7.6	0.3	116.8	NA	NA
1973	87.0	7.0	10.4	0.3	104.6	NA	NA
1974	83.5	6.2	6.6	0.3	96.6	NA	NA
1975	110.7	8.8	8.5	0.2	128.3	NA	NA
1976	117.4	9.9	7.1	0.2	134.7	NA	NA
1977	133.2	12.8	11.1	0.2	157.3	NA	NA
1978	128.2	8.3	9.0	0.4	145.9	NA	NA
1979	159.7	10.2	11.8	0.3	182.0	20.8	202.8
1980	183.0	9.1	12.0	NA	204.0	24.4	228.4
1981	168.9	6.5	9.9	NA	185.3	24.2	209.4
1982	181.1	4.6	9.5	NA	195.3	36.8	232.0
1983	155.6	4.3	8.7	NA	168.7	33.9	202.6
1984	179.7	6.2	11.3	NA	197.2	34.1	231.3
1985	156.4	3.4	10.4	NA	170.2	33.1	203.4
1986	161.8	3.0	10.4	NA	175.2	32.1	207.3
1987	170.8	3.9	10.8	NA	185.5	28.3	213.8
1988[3]	146.1	3.5	9.7	NA	159.4	31.0	190.4

[1] Includes transportation sector.

[2] Stocks at retail dealers, excluding anthracite.

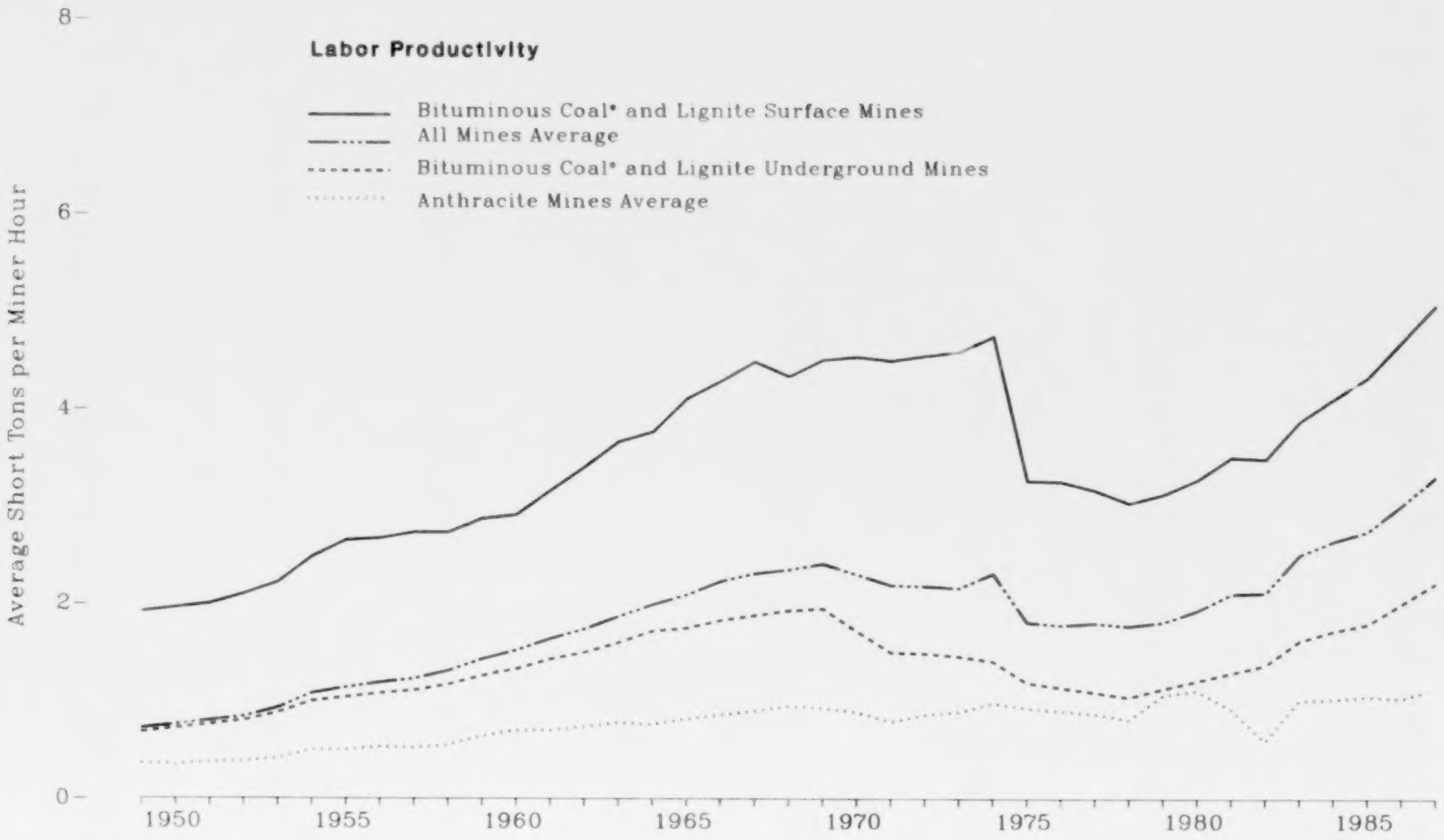
[3] Estimated, except electric utilities which is final.

NA = Not available.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1949 through 1975—Bureau of Mines, *Minerals Yearbook*, "Coal-Bituminous and Lignite" and "Coal-Pennsylvania Anthracite" chapters. •1976—Energy Information Administration, Energy Data Report, *Coal-Bituminous and Lignite in 1976* and *Coal-Pennsylvania Anthracite 1976*. •1977 and 1978—Energy Information Administration, Energy Data Report, *Coal-Pennsylvania Anthracite 1977*; *...1978* and *Weekly Coal Report*. •1979 through 1980—Energy Information Administration, Energy Data Report, *Weekly Coal Report*. •1981—Energy Information Administration, *Weekly Coal Production*. •1982 and forward—Energy Information Administration, *Quarterly Coal Report*.

Figure 81. Coal Mining Productivity, 1949-1987



*Includes subbituminous coal.
Source: See Table 81.

Table 81. Coal Mining Productivity, 1949-1987

Year	Bituminous Coal[1] and Lignite Mines									Anthracite Mines			All Mines Average		
	Underground			Surface			Average								
	Production[2]	Productive Capacity[3]	Utilization Rate[4]	Production[2]	Productive Capacity[3]	Utilization Rate[4]	Production[2]	Productive Capacity[3]	Utilization Rate[4]	Production[2]	Productive Capacity[3]	Utilization Rate[4]	Production[2]	Productive Capacity[3]	Utilization Rate[4]
1949	0.68	NA	NA	1.92	NA	NA	0.80	NA	NA	0.36	NA	NA	0.72	NA	NA
1950	0.72	NA	NA	1.96	NA	NA	0.85	NA	NA	0.35	NA	NA	0.76	NA	NA
1951	0.76	NA	NA	2.00	NA	NA	0.88	NA	NA	0.37	NA	NA	0.80	NA	NA
1952	0.80	NA	NA	2.10	NA	NA	0.93	NA	NA	0.38	NA	NA	0.84	NA	NA
1953	0.88	NA	NA	2.22	NA	NA	1.02	NA	NA	0.41	NA	NA	0.93	NA	NA
1954	1.00	NA	NA	2.48	NA	NA	1.18	NA	NA	0.50	NA	NA	1.08	NA	NA
1955	1.04	NA	NA	2.65	NA	NA	1.23	NA	NA	0.50	NA	NA	1.14	NA	NA
1956	1.08	NA	NA	2.67	NA	NA	1.29	NA	NA	0.53	NA	NA	1.19	NA	NA
1957	1.11	NA	NA	2.73	NA	NA	1.32	NA	NA	0.52	NA	NA	1.23	NA	NA
1958	1.17	NA	NA	2.73	NA	NA	1.42	NA	NA	0.55	NA	NA	1.31	NA	NA
1959	1.26	NA	NA	2.87	NA	NA	1.53	NA	NA	0.64	NA	NA	1.43	NA	NA
1960	1.33	NA	NA	2.91	NA	NA	1.60	NA	NA	0.70	NA	NA	1.52	NA	NA
1961	1.43	NA	NA	3.16	NA	NA	1.73	NA	NA	0.70	NA	NA	1.64	NA	NA
1962	1.50	NA	NA	3.40	NA	NA	1.84	NA	NA	0.74	NA	NA	1.74	NA	NA
1963	1.60	NA	NA	3.66	NA	NA	1.98	NA	NA	0.78	NA	NA	1.87	NA	NA
1964	1.72	NA	NA	3.76	NA	NA	2.11	NA	NA	0.76	NA	NA	1.99	NA	NA
1965	1.75	NA	NA	4.10	NA	NA	2.19	NA	NA	0.82	NA	NA	2.09	NA	NA
1966	1.83	NA	NA	4.28	NA	NA	2.32	NA	NA	0.86	NA	NA	2.23	NA	NA
1967	1.88	NA	NA	4.48	NA	NA	2.40	NA	NA	0.90	NA	NA	2.31	NA	NA
1968	1.93	NA	NA	4.33	NA	NA	2.42	NA	NA	0.95	NA	NA	2.35	NA	NA
1969	1.95	NA	NA	4.50	NA	NA	2.49	NA	NA	0.93	NA	NA	2.41	NA	NA
1970	1.72	NA	NA	4.53	NA	NA	2.36	NA	NA	0.89	NA	NA	2.30	NA	NA
1971	1.50	NA	NA	4.49	NA	NA	2.25	NA	NA	0.79	NA	NA	2.19	NA	NA
1972	1.49	NA	NA	4.54	NA	NA	2.22	NA	NA	0.86	NA	NA	2.18	NA	NA
1973	1.46	NA	NA	4.58	NA	NA	2.20	NA	NA	0.89	NA	NA	2.16	NA	NA
1974	1.41	NA	NA	4.74	NA	NA	2.35	NA	NA	0.98	NA	NA	2.31	NA	NA
1975	1.19	NA	NA	3.26	NA	NA	1.83	NA	NA	0.93	NA	NA	1.81	NA	NA
1976	1.14	NA	NA	3.25	NA	NA	1.80	NA	NA	0.90	NA	NA	1.78	NA	NA
1977	1.09	NA	NA	3.16	NA	NA	1.82	NA	NA	0.87	NA	NA	1.80	NA	NA
1978	1.04	NA	NA	3.03	NA	NA	1.79	NA	NA	0.81	NA	NA	1.77	NA	NA
1979	1.13	1,615	90.1	3.12	2,102	86.1	1.82	3,717	87.8	1.06	18	100.0	1.81	3,736	87.9
1980	1.21	1,734	88.3	3.27	2,300	85.2	1.94	4,034	86.5	1.11	30	86.9	1.93	4,066	86.5
1981	1.29	1,854	87.5	3.50	2,357	86.9	2.11	4,211	87.1	0.92	26	82.8	2.10	4,239	87.1
1982	1.37	1,859	90.7	3.48	2,234	88.4	2.14	4,093	89.4	0.59	17	96.7	2.11	4,112	89.5
1983	1.62	1,658	89.6	3.87	2,169	88.7	2.52	3,827	89.1	1.01	22	83.2	2.50	3,849	89.0
1984	1.72	1,773	92.1	4.10	2,320	91.6	2.65	4,092	91.8	1.02	19	92.8	2.64	4,111	91.8
1985	1.79	1,813	88.6	4.32	2,268	91.1	2.76	4,081	90.0	1.05	25	90.8	2.74	4,106	90.0
1986	2.00	1,807	92.6	4.69	2,214	93.8	3.04	4,022	93.3	1.03	18	94.0	3.01	4,040	93.3
1987	2.21	NA	NA	5.06	NA	NA	3.32	NA	NA	1.13	NA	NA	3.30	NA	NA

[1] Includes subbituminous coal.

[2] Short tons per miner hour. Data for bituminous coal and lignite mines 1949 through 1973 and anthracite mines 1949 through 1978 were originally reported in short tons per miner-day. These data have been converted to short-tons per miner hour by assuming an eight-hour day. All remaining data were calculated by dividing total production by total labor hours worked by all mine employees except office workers.

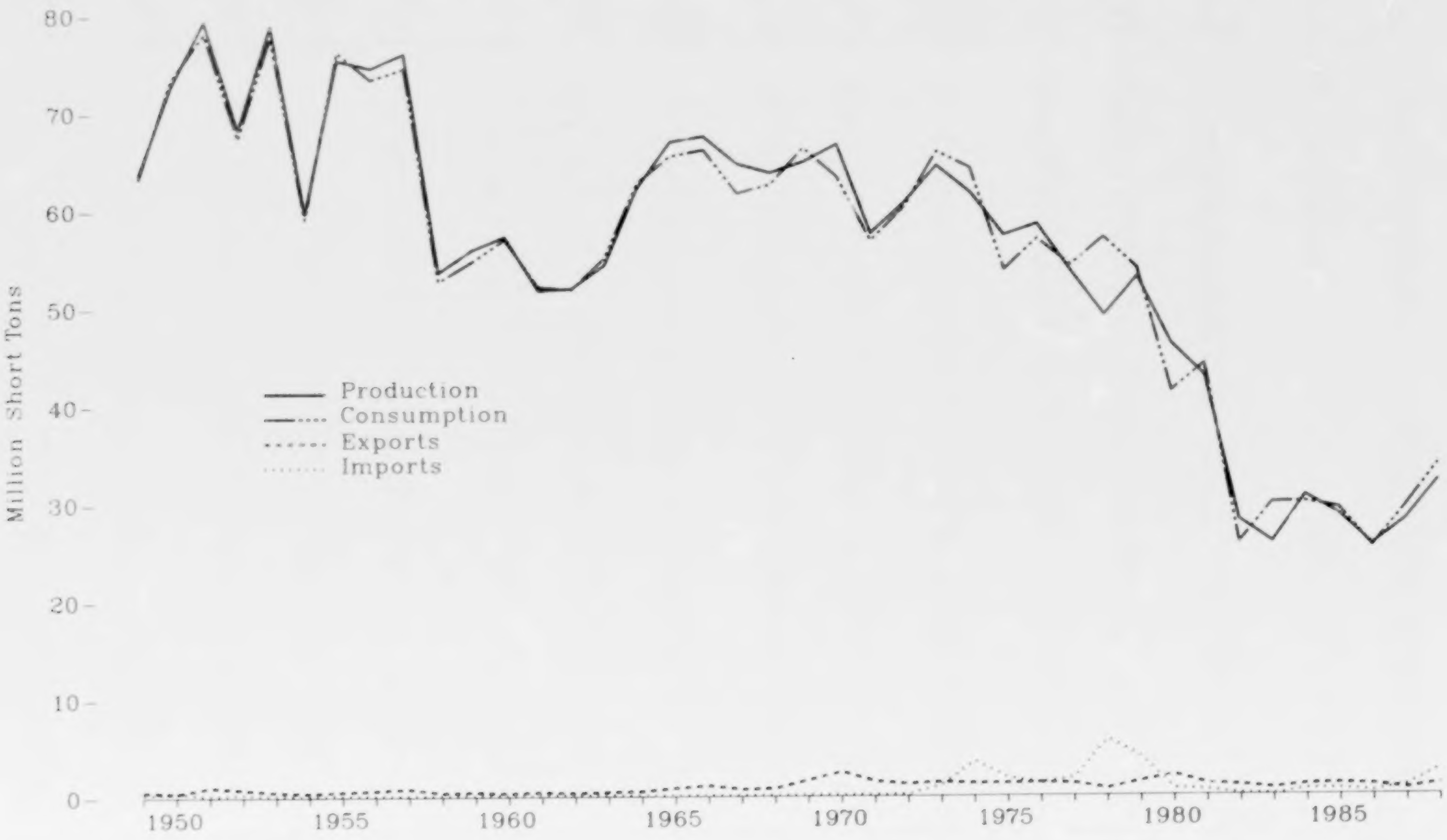
[3] Thousand short tons per day, at end of year.

[4] Percent. Calculated by dividing average daily production by daily productive capacity and multiplying by 100.

NA = Not available.

Sources: **Production per Miner Hour**: •1949 through 1975—Bureau of Mines, *Minerals Yearbook*, "Coal-Bituminous and Lignite" and "Coal-Pennsylvania Anthracite" chapters. •1976—Energy Information Administration, Energy Data Report, *Coal-Bituminous and Lignite in 1976* and *Coal-Pennsylvania Anthracite 1976*. •1977 and 1978—Energy Information Administration, Energy Data Report, *Bituminous Coal and Lignite Production and Mine Operations-1977; ....1978* and *Coal-Pennsylvania Anthracite 1977; ....1978*. •1979—Energy Information Administration, Energy Data Report, *Coal Production-1979*. •1980 and forward—Energy Information Administration, *Coal Production* (annual). **All Other Data:** Energy Information Administration, Form EIA-7A, "Coal Production Report."

Figure 82. Coke Overview, 1949-1988



Source: See Table 82

Table 82. Coke Overview, 1949-1988

(Million Short Tons)

Year	Production	Imports	Exports	Stock Change	Apparent Consumption
1949	63.64	0.28	0.55	-0.18	63.19
1950	72.72	0.44	0.40	0.66	73.42
1951	79.33	0.16	1.03	-0.37	78.09
1952	68.25	0.31	0.79	-0.42	67.36
1953	78.84	0.16	0.52	-0.78	77.70
1954	59.66	0.12	0.39	-0.27	59.12
1955	75.30	0.13	0.53	1.25	76.15
1956	74.48	0.13	0.66	-0.63	73.32
1957	75.95	0.12	0.82	-0.81	74.43
1958	53.60	0.12	0.39	-0.68	52.66
1959	55.86	0.12	0.46	-0.86	54.67
1960	57.23	0.13	0.35	-0.06	56.95
1961	51.71	0.13	0.45	0.70	52.09
1962	51.91	0.14	0.36	0.14	51.82
1963	54.28	0.15	0.45	1.02	55.00
1964	62.15	0.10	0.52	0.91	62.64
1965	66.85	0.09	0.83	-0.73	65.38
1966	67.40	0.10	1.10	-0.38	66.02
1967	64.58	0.09	0.71	-2.39	61.57
1968	63.65	0.09	0.79	-0.52	62.44
1969	64.76	0.17	1.63	2.87	66.17
1970	66.53	0.15	2.48	-0.99	63.21
1971	57.44	0.17	1.51	0.59	56.69
1972	60.51	0.19	1.23	0.59	60.05
1973	64.33	1.09	1.40	1.76	65.77
1974	61.58	3.54	1.28	0.25	64.09
1975	57.21	1.82	1.27	-4.06	53.69
1976	58.33	1.31	1.32	-1.50	56.83
1977	53.51	1.83	1.24	0.05	54.14
1978	49.01	5.72	0.69	2.91	56.95
1979	52.94	3.97	1.44	-1.65	53.83
1980	46.13	0.66	2.07	-3.44	41.28
1981	42.79	0.53	1.17	1.90	44.05
1982	28.12	0.12	0.99	-1.47	25.78
1983	25.81	0.04	0.67	4.67	29.85
1984	30.56	0.58	1.05	-0.20	29.90
1985	28.65	0.58	1.12	1.16	29.27
1986	25.54	0.33	1.00	0.49	25.35
1987	28.04	0.92	0.57	1.00	29.39
1988[2]	32.10	2.69	1.09	0.06	33.76

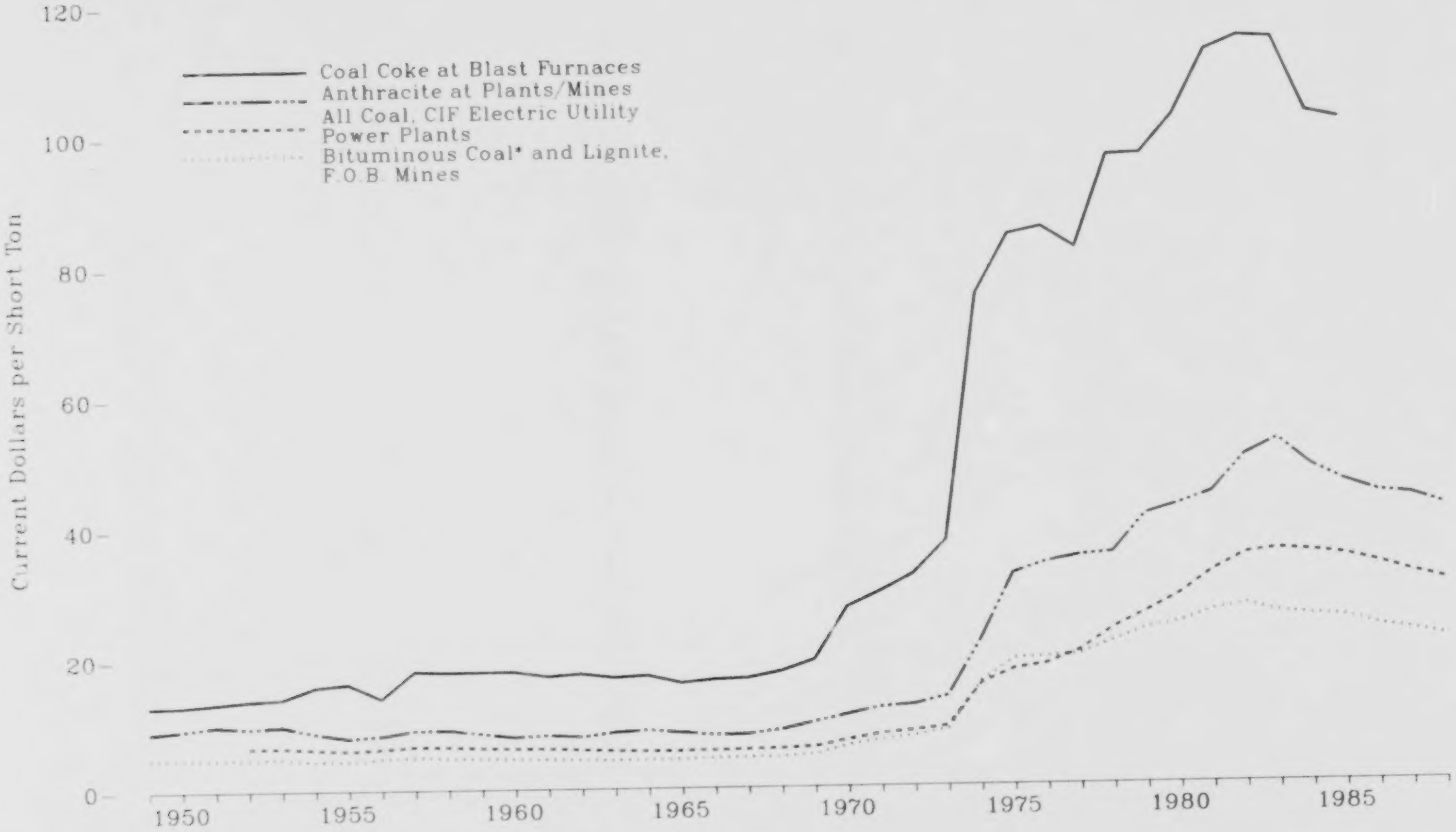
[1] Negative numbers denote a net addition to stocks or a reduction in supply. Positive numbers denote a net withdrawal from stocks or an addition to supply.

[2] Preliminary, except imports and exports which are final.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1949 through 1975—Bureau of Mines, *Minerals Yearbook*, "Coke and Coal Chemicals" chapter. •1976 through 1980—Energy Information Administration, Energy Data Report, *Coke and Coal Chemicals*, annual. •1981—Energy Information Administration, Energy Data Report, *Coke Plant Report*, quarterly. •1982 and forward—Energy Information Administration, *Quarterly Coal Report*.

Figure 83. Coal and Coal Coke Prices, 1949-1988



*Includes subbituminous coal.
Source: See Table 83.

Table 83. Coal and Coal Coke Prices, 1949-1988

(Dollars per Short Ton)

Year	Bituminous Coal [1] and Lignite		Anthracite		All Coal		Coal Coke	
	F.O.B.[2] Mines		At Plants/Mines [3]		CIF [4] Electric Utility Power Plants		At Blast Furnaces	
	Current	Constant[5]	Current	Constant[5]	Current	Constant[5]	Current	Constant[5]
1949	4.88	20.77	8.90	37.87	NA	NA	12.90	54.89
1950	4.84	20.25	9.34	39.08	NA	NA	12.96	54.23
1951	4.92	19.60	9.94	39.60	NA	NA	13.36	53.23
1952	4.90	19.22	9.58	37.57	6.61	25.92	13.81	54.16
1953	4.92	19.00	9.87	38.11	6.61	25.52	14.03	54.17
1954	4.52	17.19	8.76	33.31	6.31	23.99	15.82	60.15
1955	4.50	16.54	8.00	29.41	6.07	22.32	16.29	59.89
1956	4.82	17.15	8.33	29.64	6.32	22.49	14.03	49.93
1957	5.08	17.46	9.11	31.31	6.64	22.82	18.15	62.37
1958	4.86	16.36	9.14	30.77	6.58	22.15	17.98	60.54
1959	4.77	15.69	8.55	28.13	6.37	20.95	18.01	59.24
1960	4.69	15.18	8.01	25.92	6.26	20.26	18.02	58.32
1961	4.58	14.68	8.26	26.47	6.20	19.87	17.27	55.35
1962	4.48	14.04	7.99	25.05	6.02	18.87	17.64	55.30
1963	4.39	13.55	8.64	26.67	5.86	18.09	17.06	52.65
1964	4.45	13.53	8.93	27.14	5.74	17.45	17.30	52.58
1965	4.44	13.14	8.51	25.18	5.71	16.89	16.11	47.66
1966	4.54	12.97	8.08	23.09	5.76	16.46	16.56	47.31
1967	4.62	12.87	8.15	22.70	5.85	16.30	16.74	46.63
1968	4.67	12.39	8.78	23.29	5.93	15.73	17.72	47.00
1969	4.99	12.54	9.91	24.90	6.13	15.40	19.42	48.79
1970	6.26	14.90	11.03	26.26	7.13	16.98	27.43	65.31
1971	7.07	15.92	12.08	27.21	8.00	18.02	29.73	66.96
1972	7.66	16.47	12.40	26.67	8.44	18.15	32.33	69.53
1973	8.53	17.23	13.65	27.58	9.01	18.20	37.42	75.60
1974	15.75	29.17	22.19	41.09	15.46	28.63	75.00	138.89
1975	19.23	32.43	32.26	54.40	17.63	29.73	84.03	141.70
1976	19.43	30.79	33.92	53.76	18.38	29.13	85.09	134.85
1977	19.82	29.45	34.86	51.80	20.37	30.27	81.91	121.71
1978	21.78	30.17	35.25	48.82	23.75	32.89	95.95	132.89
1979	23.65	30.09	41.06	52.24	26.15	33.27	96.11	122.28
1980	24.52	28.61	42.51	49.60	28.76	33.56	101.93	118.94
1981	26.29	27.97	44.28	47.11	32.31	34.37	111.79	118.93
1982	27.14	27.14	49.85	49.85	34.90	34.90	113.91	113.91
1983	25.85	24.88	52.29	50.33	35.50	34.17	113.55	109.29
1984	25.51	23.69	48.22	44.77	35.12	32.61	102.34	95.02
1985	25.10	22.63	45.80	41.30	34.53	31.14	101.16	91.22
1986	23.70	20.81	44.12	38.74	33.30	29.24	NA	NA
1987	23.00	19.54	43.65	37.09	31.83	27.04	NA	NA
1988[e]	22.00	18.08	42.00	34.51	30.60	25.14	NA	NA

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[1] Includes subbituminous coal. [2] Free on board (see Glossary). [3] For 1949 through 1978 prices are F.O.B. preparation plants. For 1979 forward prices are F.O.B. mines. [4] Cost, Insurance, and Freight (see Glossary). [5] In 1982 dollars, calculated using implicit GNP price deflators. See Appendix C. [e] Estimate. NA = Not available. Sources: **Bituminous Coal and Lignite, F.O.B. Mines** •1949 through 1975—Bureau of Mines, *Minerals Yearbook*, "Coal-Bituminous and Lignite" chapter. •1976—Energy Information Administration, Energy Data Report, *Coal-Bituminous and Lignite in 1976*. •1977 and 1978—Energy Information Administration, Energy Data Report, *Bituminous Coal and Lignite Production and Mine Operations-1977; ....1978.* •1979 through 1987—Energy Information Administration, *Coal Production*, annual. •1988—Energy Information Administration estimates. **Anthracite** •1949 through 1976—Bureau of Mines, *Minerals Yearbook*, "Coal-Pennsylvania Anthracite" chapter. •1977 and 1978—Energy Information Administration, Energy Data Report, *Coal-Pennsylvania Anthracite 1977; ....1978.* •1979—Energy Information Administration, Energy Data Report, *Coal Production-1979.* •1980—Energy Information Administration, *Coal Production-1980.* •1981 through 1987—Energy Information Administration, *Coal Production*, annual. •1988—Energy Information Administration estimates. **All Coal, CIF Electric Utility Power Plants** •1949 through 1972—National Coal Association, *Steam Electric Plant Factors.* •1973 through 1982—Federal Power Commission, FPC Form 423, "Monthly Report of Cost and Quality of Fuels for Electric Plants." •1983 and forward—Federal Energy Regulatory Commission, FERC Form 423, "Monthly Report of Cost and Quality of Fuel for Electric Utilities." **Coal Coke** •1949 through 1975—Bureau of Mines, *Minerals Yearbook*, "Coke and Coal Chemicals" chapter. •1976 through 1980—Energy Information Administration, Energy Data Report, *Coke and Coal Chemicals*, annual. •1981—Energy Information Administration, Energy Data Report, *Coke Plant Report*, quarterly. •1982 and forward—Energy Information Administration, *Quarterly Coal Report.*

8. Electricity

Measuring Electricity Generation

Electricity generation is measured and recorded in kilowatthours. Theoretically, a 1,000-kilowatt generator operating at maximum capacity for 1 year would produce 8,760,000 kilowatthours of electricity (1,000 kilowatts times 24 hours per day times 365 days per year). However, generators require maintenance and therefore cannot operate continuously.

In addition, electricity demand varies both daily and seasonally, so that continuous operation of all generators is not necessary to meet demand. Utilities rely on "baseload" generating plants, usually conventional steam, nuclear, and large hydroelectric plants, to satisfy steady demand. Gas turbine, internal combustion, and other hydroelectric plants are generally used to satisfy peak demand. Those "peaking" plants are used only during relatively short periods of high demand.

Generating Capacity

Generating capacity is expressed as net summer capability, a measure of the steady hourly output that generating equipment is expected to supply to the system load, exclusive of auxiliary power, as demonstrated by test at the time of summer peak demand. Although data on net summer capability have been collected only since 1984, the Energy Information Administration has estimated values for prior years (90).[1] Estimates indicate that generating capacity during the 1949-to-1988 period increased at an average annual rate of 6.3 percent. Conventional steam plants, fueled by fossil fuels, wood, and waste, were responsible for most of the growth. In 1988, they accounted for almost two-thirds of total generation capacity. Nuclear-powered plants accounted for 14 percent and hydroelectric facilities accounted for 13 percent of the total in 1988. Internal combustion and gas turbine plants, as well as plants powered by emerging sources of energy such as geothermal, accounted for the remainder.

Generation by Source and Prime Mover

Net generation of electricity by electric utilities in 1988 reached 2.7 trillion kilowatthours, up 5 percent from the 1987 level (85). The 1987-to-1988 growth in generation was the largest annual percent gain recorded since the unprecedented drop in net generation in 1982.

Fossil fuels, particularly coal, continued to fuel most of the generation in 1988 (85). Coal accounted for 1,537 billion kilowatthours, and natural gas accounted for 253 billion kilowatthours. As oil prices declined in 1988, oil-fired generation expanded by 26 percent to a total of 149 billion kilowatthours for the year.

Nuclear-based generation surpassed its previous-year level for the eighth consecutive year, reaching an all-time high in 1988 of 527 billion kilowatthours. Due to 2 consecutive years of drought, however, hydroelectric generation declined to 223 billion kilowatthours in 1988, 23 percent below the level in 1986, prior to the droughts. Geothermal and other alternative energy sources accounted for 12 billion kilowatthours.

Fossil-fueled steam generators, consistently the major source of electricity, provided 71 percent of net generation in 1988 (86). Nuclear, hydroelectric, geothermal, and other generators powered by renewables supplied 28 percent. Internal combustion and gas turbine generators, usually reserved for meeting peak demand, supplied less than 1 percent of net generation.

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[1] Numbers in parentheses indicate related tables. Annual data are the most recent available and frequently are preliminary.

Fossil Fuel Consumption

During the 1949-to-1988 period, consumption of coal at electric utilities grew at a faster rate than did consumption of natural gas and petroleum (88). On a Btu basis, coal accounted for 67 percent of total fossil fuel consumption in 1949 and 79 percent of the total in 1988.

Electric utility consumption of both petroleum and natural gas increased during most of the 1949-to-1988 period, but growth in the use of both fuels began to slow during the 1970's and, during the first half of the 1980's, consumption actually decreased.

Changes in the consumption of petroleum and natural gas at electric utilities in 1986 through 1988 were particularly illustrative of the utilities' fuel-switching capabilities and their use of them to respond to fluctuations in fuel prices. In 1986, when oil prices fell dramatically, petroleum consumption at electric utilities rose by 0.36 quadrillion Btu, while natural gas consumption fell 0.47 quadrillion Btu. When oil prices recovered somewhat in 1987, electric utilities scaled back consumption of petroleum by 0.19 quadrillion Btu while increasing natural gas consumption by 0.25 quadrillion Btu. In response to the 1988 decline in oil prices, electric utilities increased petroleum consumption by 0.30 quadrillion Btu and consumed 0.22 quadrillion Btu less of natural gas.

Sales to Consumers

From 1949 through 1985 (the most recent year for which "old series"[2] statistics are available), electricity sales increased at an average annual rate of 6.3 percent (89). Annual sales declined only twice, during the economic recessions of 1974 and 1982. In 1974, the decline in sales spanned all sectors, whereas in 1982, lower sales to the industrial sector alone accounted for the decline.

From 1984 through 1988 (the period for which "new series" statistics are available), electricity sales increased at an average annual rate of 2.9 percent.

Throughout most of the 1949-to-1988 period, sales of electricity to the industrial sector exceeded sales to other sectors, but in 1986 sales to residential customers surpassed industrial sales for the first time. Sales to the commercial sector remained lower than sales to the other two major sectors throughout the period.

In 1988, sales to all sectors combined—and sales to each of the three major end-use sectors—rose 5 percent from the 1987 level to 2,566 billion kilowatthours for the year. Sales to residential customers reached 890 billion kilowatthours. The increase from the 1987 level was partly due to adverse weather conditions that boosted space heating and cooling requirements. Industrial sales increased to 884 billion kilowatthours as economic growth led to increased demand. Due to the unusual weather conditions and the strong economic growth, commercial sales increased to 710 billion kilowatthours.

Electricity Prices

Based on "old series"[3] statistics, the weighted average real price[4] of electricity to all sectors in 1988 was 5.4 cents per kilowatthour, 9 percent below the price in 1960 (92). However, the apparent stability in electricity prices masked fluctuations that occurred throughout the period and variations in prices paid by consumers in different end-use sectors. And although prices of the other major energy sources increased significantly during the 29-year period, electricity remained by far the most expensive source of energy on a Btu basis.

Based on "new series" statistics, the average real price of electricity sold to the residential sector, where prices have usually been the highest, was 6.2 cents per kilowatthour in 1988, 2 percent below the price in 1987. Similarly, the commercial sector experienced a decline, in real terms, of 3 percent, as the price declined to 5.8 cents per kilowatthour in 1988. Meanwhile, industrial customers continued to pay prices favorable compared with prices in other sectors. In 1988, the real price of electricity sold to industrial users was 3.8 cents per kilowatthour.

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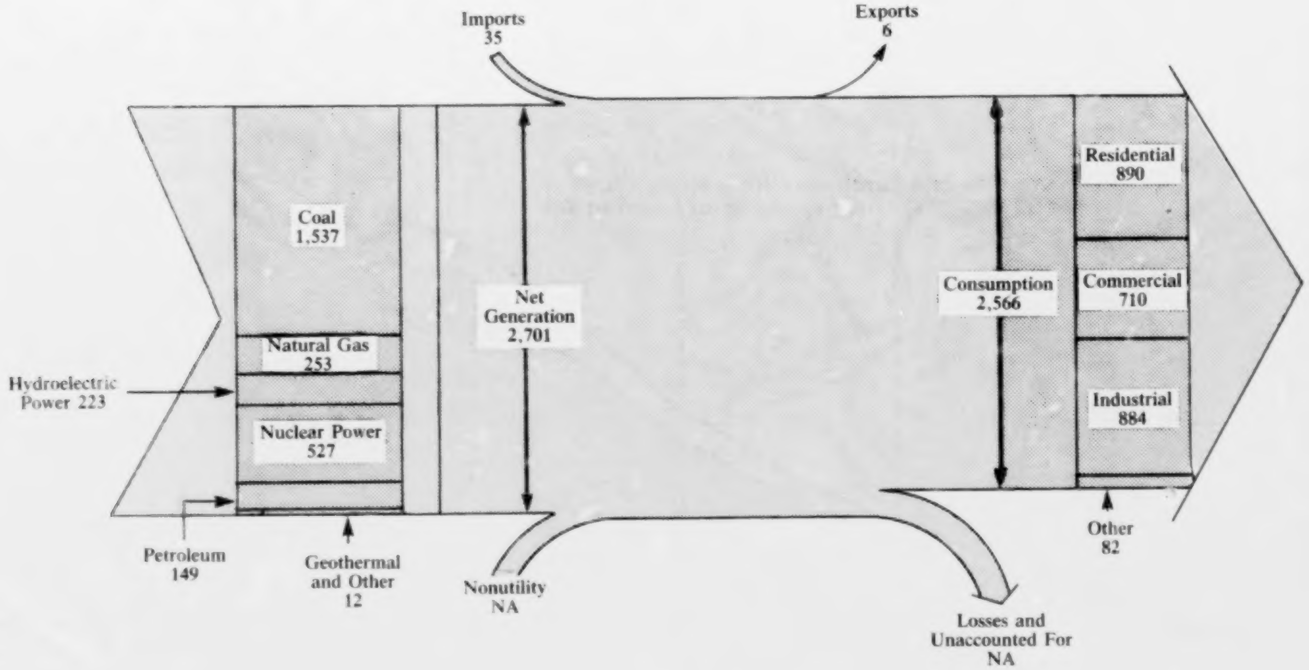
[2] See Table 89 footnotes for an explanation of "old series" and "new series" statistics on electricity sales.

[3] See Table 92 footnotes for an explanation of "old series" and "new series" statistics on retail prices of electricity.

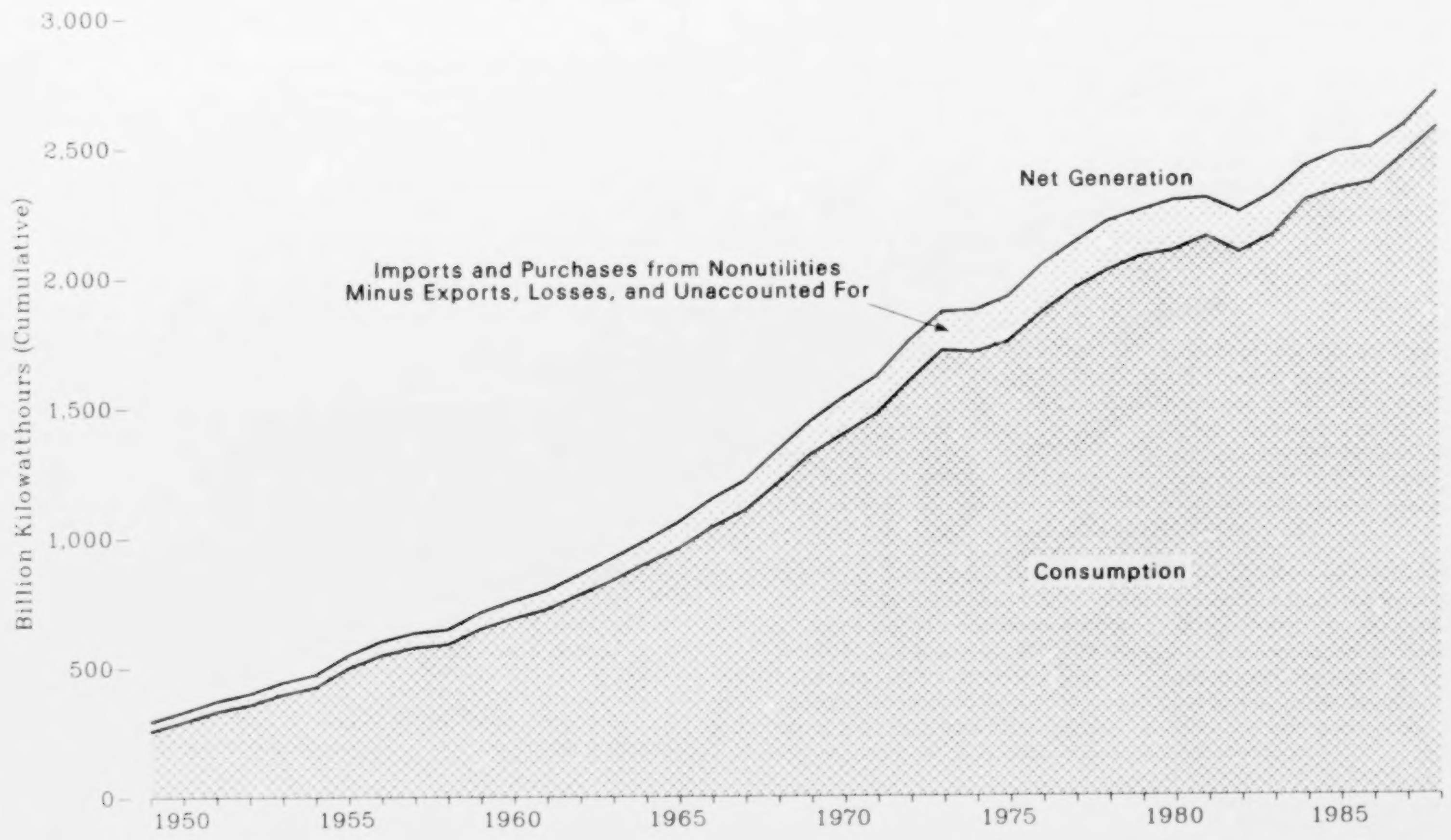
[4] Real prices are expressed in constant 1982 dollars.

Diagram 5. Electric Utility Electricity Flow, 1988
(Billion Kilowatthours)


Imports
35
Exports
6
Coal
1,537
Natural Gas
253
Hydroelectric
Power 223
Nuclear Power
527
Petroleum
149
Geothermal
and Other
12
Net
Generation
2,701
Nonutility
NA
Consumption
2,566
Residential
890
Commercial
710
Industrial
884
Other
82
Losses and
Unaccounted For
NA

Note: Sum of components may not equal totals due to independent rounding.
Sources: See Tables 84, 85, and 89.

Figure 84. Electric Utility Industry Overview, 1949-1988



Source: See Table 84.

Table 84. Electric Utility Industry Overview, 1949-1988 [1]

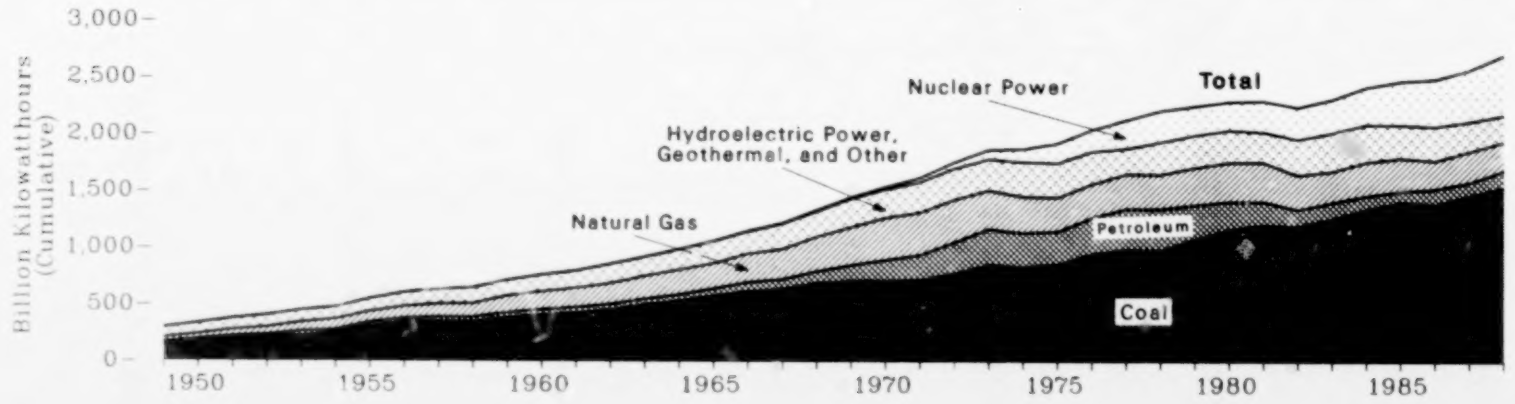
(Billion Kilowatthours)

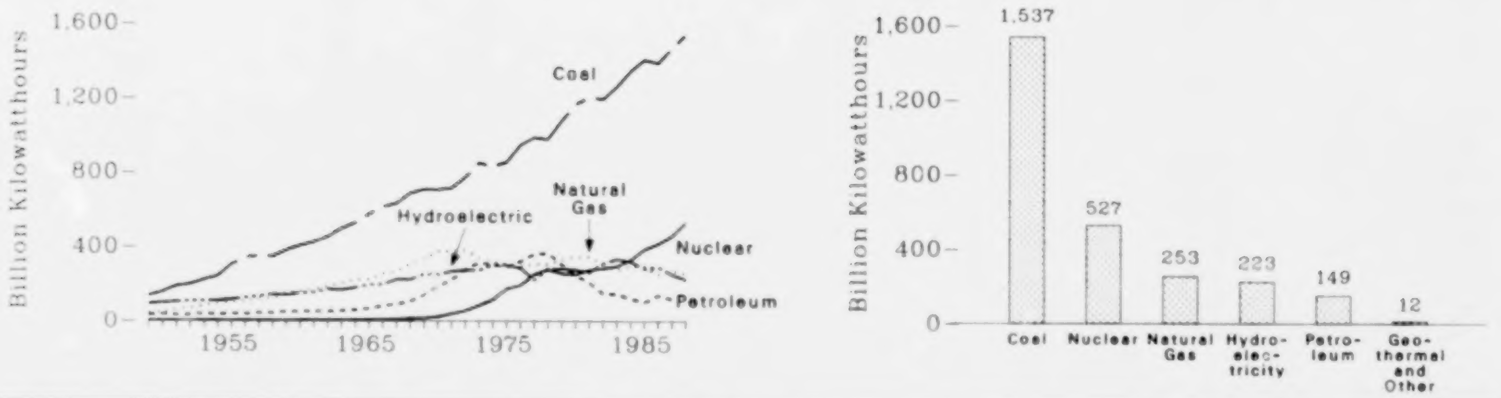
Year	Net Generation [2]	Purchases from Nonutilities [3]	Imports [4]	Exports [4]	Losses and Unaccounted For [5]	Consumption
1949	291	NA	2	(6)	38	255
1950	329	NA	2	(6)	39	291
1951	371	NA	2	(6)	43	330
1952	399	NA	3	(6)	45	356
1953	443	NA	2	(6)	48	396
1954	472	NA	3	(6)	50	424
1955	547	NA	5	(6)	54	497
1956	601	NA	5	1	59	546
1957	632	NA	5	1	59	576
1958	645	NA	4	1	61	588
1959	710	NA	4	1	67	647
1960	756	NA	5	1	72	688
1961	794	NA	3	1	74	722
1962	855	NA	2	2	77	778
1963	917	NA	2	2	84	833
1964	984	NA	6	4	90	896
1965	1,055	NA	4	4	101	954
1966	1,144	NA	4	3	110	1,035
1967	1,214	NA	4	4	115	1,099
1968	1,329	NA	4	4	126	1,203
1969	1,442	NA	5	4	129	1,314
1970	1,532	NA	6	4	142	1,392
1971	1,613	NA	7	4	147	1,470
1972	1,750	NA	10	3	162	1,595
1973	1,861	NA	17	3	162	1,713
1974	1,867	NA	15	3	174	1,706
1975	1,918	NA	11	5	177	1,747
1976	2,038	NA	11	2	191	1,855
1977	2,124	NA	20	3	193	1,948
1978	2,206	1	21	1	209	2,018
1979	2,247	1	23	2	198	2,071
1980	2,286	1	25	4	214	2,094
1981	2,295	1	36	3	182	2,147
1982	2,241	6	33	4	190	2,086
1983	2,310	13	39	3	207	2,151
1984	2,416	18	42	3	189	2,285
1985	2,470	26	46	5	211	2,326
1986	2,487	37	41	5	210	2,351
1987	2,572	48	52	6	211	2,455
1988[7]	2,701	NA	35	6	NA	2,566

---

[1] See Appendix E, Note 14. [2] See Appendix E, Note 1. [3] Electricity purchased from nonutility sources, including cogenerators, small power producers, and other nonutility power producing establishments. [4] Electricity transmitted across U.S. borders with Canada and Mexico. [5] Balancing item, mainly transmission and distribution losses. [6] Less than 0.5 billion kilowatthours. [7] Preliminary. NA = Not available. Note: Sum of components may not equal total due to independent rounding. Sources: **Net Generation:** •1949 through September 1977—Federal Power Commission, Form 4, "Monthly Power Plant Report." •October 1977 through 1981—Federal Energy Regulatory Commission, FPC Form 4, "Monthly Power Plant Report." •1982 and forward—Energy Information Administration, Form EIA-759, "Monthly Power Plant Report." **Consumption:** •1949 through September 1977—Federal Power Commission, Form 5, "Monthly Statement of Electric Operating Revenue and Income." •October 1977 through February 1980—Federal Energy Regulatory Commission, FPC Form 5, "Monthly Statement of Electric Operating Revenue and Income." •March 1980 through 1982—Federal Energy Regulatory Commission, FERC Form 5, "Electric Utility Company Monthly Statement." •1983 through 1986—Energy Information Administration, Form EIA-826, "Electric Utility Company Monthly Statement." •1987—Energy Information Administration, Form EIA-826, "Monthly Electric Utility Sales and Revenue Report with State Distributions." •1984 and 1985—Energy Information Administration, Form EIA-861, "Annual Electric Utility Report." **Imports and Exports:** •1949 through September 1977—unpublished Federal Power Commission data; •October 1977 through 1981—unpublished Economic Regulatory Administration data. •1982 and forward—Economic Regulatory Administration, *Electricity Transactions Across International Borders*. **Nonutility Supply:** •1978 and forward—Federal Energy Regulatory Commission, FERC Form 1, "Annual Report of Major Electric Utilities, Licensees and Others."

Figure 85. Net Generation of Electricity by Electric Utilities by Energy Source, 1949–1988





By Energy Source, 1949-1988

By Energy Source, 1988

Source: See Table 85.

Table 85. Net Generation of Electricity [1] by Electric Utilities by Energy Source, 1949-1988 [2]

(Billion Kilowatthours)

Year	Coal	Natural Gas	Petroleum [3]	Nuclear Power	Hydroelectric Power	Geothermal and Other [4]	Total
1949	135	37	29	0	90	(5)	291
1950	155	45	34	0	96	(5)	329
1951	185	57	29	0	100	(5)	371
1952	195	68	30	0	105	(5)	399
1953	219	80	38	0	105	(5)	443
1954	239	94	32	0	107	(5)	472
1955	301	95	37	0	113	(5)	547
1956	339	104	36	0	122	(5)	601
1957	346	114	40	(5)	130	(5)	632
1958	344	120	40	(5)	140	(5)	645
1959	378	147	47	(5)	138	(5)	710
1960	403	158	48	1	146	(5)	756
1961	422	169	49	2	152	(5)	794
1962	450	184	49	2	169	(5)	855
1963	494	202	52	3	166	(5)	917
1964	526	220	57	3	177	(5)	984
1965	571	222	65	4	194	(5)	1,055
1966	613	251	79	6	195	1	1,144
1967	630	265	89	8	222	1	1,214
1968	685	304	104	13	222	1	1,329
1969	706	333	138	14	250	1	1,442
1970	704	373	184	22	248	1	1,532
1971	713	374	220	38	266	1	1,613
1972	771	376	274	54	273	2	1,750
1973	848	341	314	83	272	2	1,861
1974	828	320	301	114	301	3	1,867
1975	853	300	289	173	300	3	1,918
1976	944	295	320	191	284	4	2,038
1977	985	306	358	251	220	4	2,124
1978	976	305	365	276	280	3	2,206
1979	1,075	329	304	255	280	4	2,247
1980	1,162	346	246	251	276	6	2,286
1981	1,203	346	206	273	261	6	2,295
1982	1,192	305	147	283	309	5	2,241
1983	1,259	274	144	294	332	6	2,310
1984	1,342	297	120	328	321	9	2,416
1985	1,402	292	100	384	281	11	2,470
1986	1,386	249	137	414	291	12	2,487
1987	1,464	273	118	455	250	12	2,572
1988[6]	1,537	253	149	527	223	12	2,701

[1] See Appendix E, Note 1.

[2] See Appendix E, Note 14.

[3] Includes distillate fuel oil, residual fuel oil (including crude oil burned as fuel), jet fuel, and petroleum coke.

[4] Other is wood, waste, wind, photovoltaic, and solar thermal energy used to generate electricity for distribution.

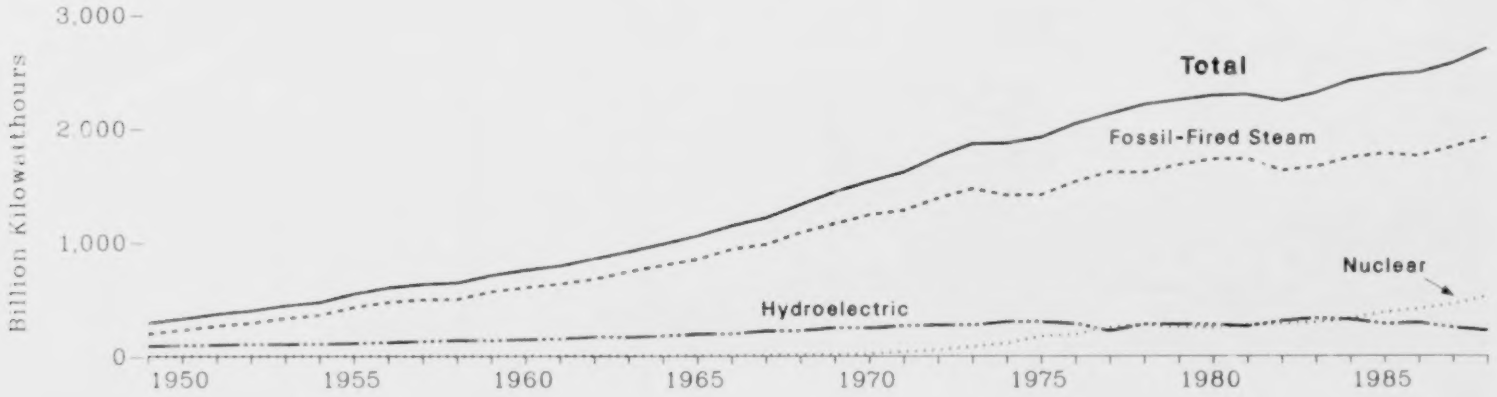
[5] Less than 0.5 billion kilowatthours.

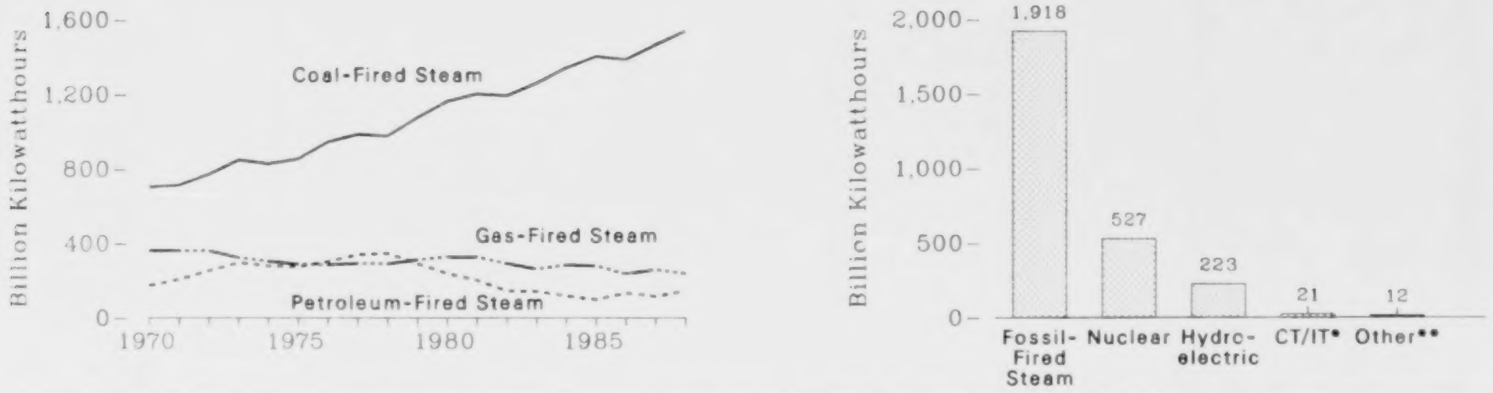
[6] Preliminary.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1949 through September 1977—Federal Power Commission, Form 4, "Monthly Power Plant Report." •October 1977 through 1981—Federal Energy Regulatory Commission, FPC Form 4, "Monthly Power Plant Report." •1982 and forward—Energy Information Administration, Form EIA-759, "Monthly Power Plant Report."

Figure 86. Net Generation of Electricity by Electric Utilities by Prime Mover





Fossil-Fired Steam by Fuel, 1970-1988

Net Generation by Prime Mover, 1988

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*CT/IT is petroleum and gas combustion turbine/internal combustion units. **Other is geothermal, wood, waste, wind, photovoltaic, and solar thermal energy used to generate electricity for distribution.

Source: See Table 86.

Table 86. Net Generation of Electricity [1] by Electric Utilities by Prime Mover, 1949-1988 [2]

(Billion Kilowatthours)

Year	Fossil-Fired Steam: Coal-Fired	Fossil-Fired Steam: Petroleum-Fired	Fossil-Fired Steam: Gas-Fired	Fossil-Fired Steam: Total	Internal Combustion and Gas Turbine	Nuclear	Hydroelectric	Other [3]	Total
1949	135	NA	NA	197	3	0	90	(4)	291
1950	155	NA	NA	229	4	0	96	(4)	329
1951	185	NA	NA	267	4	0	100	(4)	371
1952	195	NA	NA	290	4	0	105	(4)	399
1953	219	NA	NA	333	4	0	105	(4)	443
1954	239	NA	NA	361	4	0	107	(4)	472
1955	301	NA	NA	430	4	0	113	(4)	547
1956	339	NA	NA	474	4	0	122	(4)	601
1957	346	NA	NA	497	4	(4)	130	(4)	632
1958	344	NA	NA	500	4	(4)	140	(4)	645
1959	378	NA	NA	567	4	(4)	138	(4)	710
1960	403	NA	NA	603	4	1	146	(4)	756
1961	422	NA	NA	634	5	2	152	(4)	794
1962	450	NA	NA	677	5	2	169	(4)	855
1963	494	NA	NA	742	5	3	166	(4)	917
1964	526	NA	NA	798	6	3	177	(4)	984
1965	571	NA	NA	851	6	4	194	(4)	1,055
1966	613	NA	NA	938	5	6	195	1	1,144
1967	630	NA	NA	980	5	8	222	1	1,214
1968	685	NA	NA	1,084	9	13	222	1	1,329
1969	706	NA	NA	1,163	14	14	250	1	1,442
1970	704	174	361	1,240	22	22	248	1	1,532
1971	713	206	360	1,279	28	38	266	1	1,613
1972	771	253	361	1,385	36	54	273	2	1,750
1973	848	296	323	1,467	36	83	272	2	1,861
1974	828	279	304	1,411	38	114	301	3	1,867
1975	853	273	288	1,414	28	173	300	3	1,918
1976	944	302	284	1,530	29	191	284	4	2,038
1977	985	338	292	1,615	34	251	220	4	2,124
1978	976	345	290	1,610	36	276	280	3	2,206
1979	1,075	290	311	1,676	32	255	280	4	2,247
1980	1,162	238	326	1,726	28	251	276	6	2,286
1981	1,203	202	325	1,730	25	273	261	6	2,295
1982	1,192	144	291	1,628	16	283	309	5	2,241
1983	1,259	141	261	1,661	17	294	332	6	2,310
1984	1,342	117	284	1,742	17	328	321	9	2,416
1985	1,402	97	279	1,778	16	384	281	11	2,470
1986	1,386	133	236	1,756	15	414	291	12	2,487
1987	1,464	115	258	1,837	18	455	250	12	2,572
1988[5]	1,537	144	237	1,918	21	527	223	12	2,701

[1] See Appendix E, Note 1.

[2] See Appendix E, Note 14.

[3] Other is geothermal, wood, waste, wind, photovoltaic, and solar thermal energy used to generate electricity for distribution.

[4] Less than 0.5 billion kilowatthours.

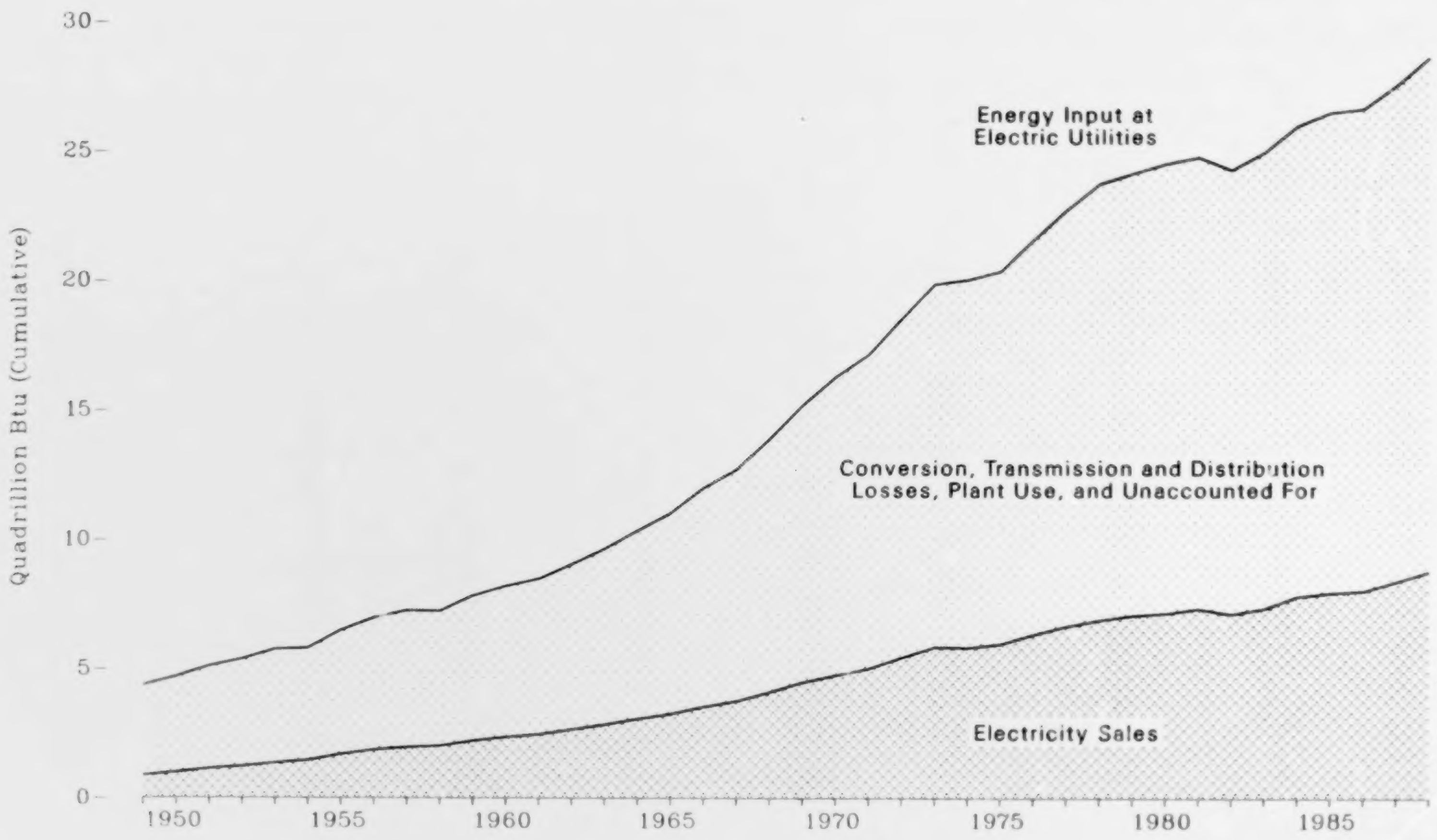
[5] Preliminary.

NA = Not available.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1949 through September 1977—Federal Power Commission, Form 4, "Monthly Power Plant Report." •October 1977 through 1981—Federal Energy Regulatory Commission, FPC Form 4, "Monthly Power Plant Report." •1982 and forward—Energy Information Administration, Form EIA-759, "Monthly Power Plant Report."

Figure 87. Energy Input at Electric Utilities and Electricity Sales, 1949-1988



Source: See Table 87.

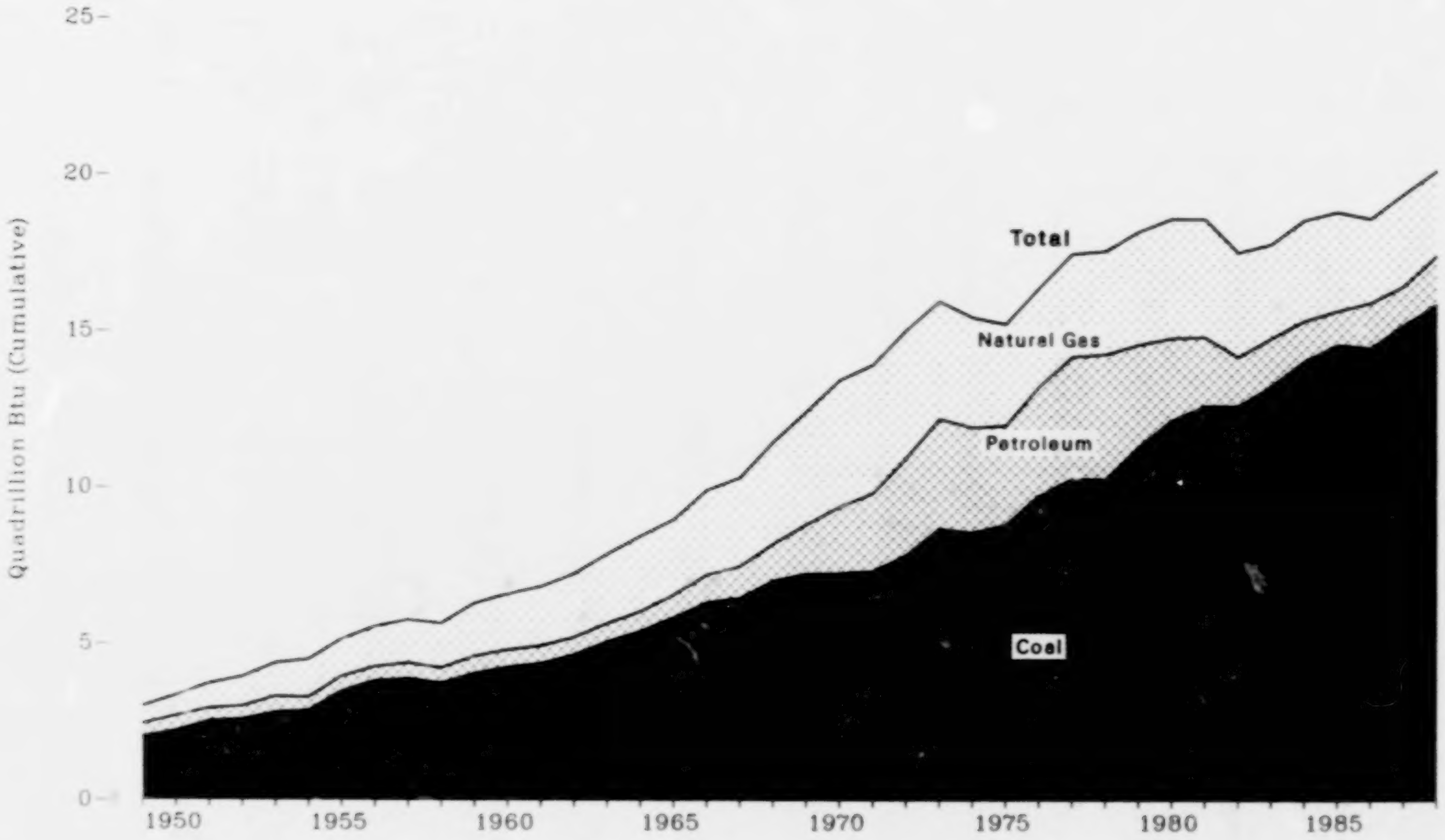
Table 87. Energy Input at Electric Utilities and Electricity Sales, 1949-1988 [1]

(Quadrillion Btu)

	Input/Generation													
				Nuclear Power		Hydroelectric Power [2]		Geothermal, Wood, Waste, and Wind		Total		Losses and Other [3]		
Year	Coal	Natural Gas	Petroleum	Heat Equivalent [4]	Electricity Equivalent [5]	Fossil Fuel Equivalent [6]	Electricity Equivalent [5]	Heat Equivalent [7]	Electricity Equivalent [5]	Fossil Fuel/Heat Equivalent [8]	Electricity Equivalent [9]	Fossil Fuel/Heat Equivalent [10]	Electricity Equivalent [11]	Electricity Sales
1949	2.00	0.57	0.41	0	0	1.37	0.31	0.01	(12)	4.36	3.29	3.49	2.42	0.87
1950	2.20	0.65	0.47	0	0	1.37	0.33	0.01	(12)	4.70	3.66	3.70	2.66	0.99
1951	2.51	0.79	0.40	0	0	1.39	0.35	0.01	(12)	5.09	4.05	3.97	2.92	1.13
1952	2.56	0.94	0.42	0	0	1.43	0.37	0.01	(12)	5.36	4.29	4.15	3.07	1.22
1953	2.78	1.07	0.51	0	0	1.38	0.37	0.01	(12)	5.75	4.73	4.40	3.38	1.35
1954	2.84	1.21	0.42	0	0	1.33	0.37	(12)	(12)	5.80	4.84	4.35	3.39	1.45
1955	3.46	1.19	0.47	0	0	1.37	0.40	(12)	(12)	6.50	5.52	4.80	3.83	1.69
1956	3.79	1.28	0.45	0	0	1.45	0.43	(12)	(12)	6.98	5.96	5.11	4.10	1.86
1957	3.86	1.38	0.50	(12)	(12)	1.52	0.46	(12)	(12)	7.26	6.19	5.29	4.23	1.96
1958	3.72	1.42	0.49	(12)	(12)	1.59	0.49	(12)	(12)	7.22	6.12	5.22	4.11	2.01
1959	4.03	1.69	0.55	(12)	(12)	1.55	0.48	(12)	(12)	7.82	6.75	5.61	4.54	2.21
1960	4.23	1.79	0.55	0.01	(12)	1.62	0.51	(12)	(12)	8.19	7.08	5.84	4.73	2.35
1961	4.35	1.89	0.56	0.02	0.01	1.64	0.53	(12)	(12)	8.47	7.33	6.01	4.87	2.46
1962	4.62	2.03	0.56	0.03	0.01	1.79	0.58	(12)	(12)	9.03	7.80	6.38	5.15	2.65
1963	5.05	2.21	0.58	0.04	0.01	1.74	0.57	0.01	(12)	9.63	8.42	6.79	5.58	2.84
1964	5.38	2.40	0.63	0.04	0.01	1.87	0.61	0.01	(12)	10.33	9.03	7.27	5.98	3.06
1965	5.82	2.40	0.72	0.04	0.01	2.02	0.66	0.01	(12)	11.01	9.61	7.76	6.36	3.25
1966	6.30	2.70	0.88	0.06	0.02	2.04	0.67	0.01	(12)	11.99	10.57	8.46	7.04	3.53
1967	6.44	2.83	1.01	0.09	0.03	2.31	0.75	0.01	(12)	12.70	11.07	8.95	7.32	3.75
1968	6.99	3.25	1.18	0.14	0.04	2.31	0.76	0.01	(12)	13.88	12.22	9.78	8.12	4.10
1969	7.22	3.60	1.57	0.15	0.05	2.62	0.86	0.02	(12)	15.18	13.29	10.70	8.81	4.48
1970	7.23	4.05	2.12	0.24	0.07	2.62	0.85	0.02	(12)	16.27	14.33	11.52	9.58	4.75
1971	7.30	4.10	2.49	0.41	0.13	2.83	0.92	0.02	(12)	17.15	14.95	12.13	9.93	5.01
1972	7.81	4.08	3.10	0.58	0.18	2.91	0.96	0.03	0.01	18.52	16.14	13.08	10.70	5.44
1973	8.66	3.75	3.51	0.91	0.28	2.98	0.98	0.05	0.01	19.85	17.19	14.01	11.35	5.84
1974	8.53	3.52	3.36	1.27	0.39	3.28	1.07	0.06	0.01	20.02	16.89	14.20	11.07	5.82
1975	8.79	3.24	3.17	1.90	0.59	3.19	1.04	0.07	0.01	20.35	16.84	14.39	10.88	5.96
1976	9.72	3.15	3.48	2.11	0.65	3.03	1.00	0.08	0.01	21.57	18.01	15.24	11.68	6.33
1977	10.26	3.28	3.90	2.70	0.86	2.48	0.81	0.08	0.01	22.71	19.13	16.07	12.48	6.65
1978	10.24	3.30	3.99	3.02	0.94	3.11	1.02	0.07	0.01	23.72	19.50	16.84	12.62	6.89
1979	11.26	3.61	3.28	2.78	0.87	3.11	1.02	0.09	0.01	24.13	20.07	17.06	13.00	7.07
1980	12.12	3.81	2.63	2.74	0.86	3.08	1.01	0.11	0.02	24.50	20.46	17.36	13.31	7.15
1981	12.58	3.77	2.20	3.01	0.93	3.07	1.00	0.13	0.02	24.76	20.51	17.43	13.18	7.33
1982	12.58	3.34	1.57	3.13	0.96	3.54	1.16	0.11	0.02	24.27	19.63	17.15	12.51	7.12
1983	13.21	3.00	1.54	3.20	1.00	3.87	1.25	0.13	0.02	24.96	20.03	17.62	12.69	7.34
1984	14.02	3.22	1.29	3.55	1.12	3.72	1.23	0.17	0.03	25.98	20.90	18.18	13.11	7.80
1985	14.54	3.16	1.09	4.15	1.31	3.33	1.10	0.21	0.04	26.48	21.24	18.55	13.30	7.94
1986	14.44	2.69	1.45	4.47	1.41	3.35	1.11	0.23	0.04	26.64	21.15	18.62	13.13	8.02
1987	15.17	2.94	1.26	4.91	1.55	3.04	1.01	0.24	0.04	27.55	21.97	19.17	13.59	8.38
1988[13]	15.84	2.72	1.56	5.68	1.80	2.58	0.86	0.24	0.04	28.62	22.82	19.86	14.06	8.76

[1] See Appendix E, Note 14. [2] Includes net imports of electricity. [3] Conversion, transmission, and distribution losses, plant use, and unaccounted for. [4] The amount of heat released in reactors by fissioning uranium at electric utilities. [5] The equivalent amount of heat that could be produced by the electricity distributed using the conversion factor 3,412 Btu per kilowatthour. [6] The equivalent of fossil fuel energy required to generate the electricity distributed using the average fossil fuel steam electric plant thermal efficiency. [7] Includes for geothermal plants the heat content of the steam consumed and for wood, waste, wind and solar plants the fossil fuel equivalent using national average heat rate for fossil fuel steam electric plants. [8] Total of fossil fuels and the fossil fuel/heat equivalent of nonfossil fuel energy sources. [9] Total of fossil fuels and electricity equivalent of nonfossil fuel energy sources. [10] Balancing item, the difference between Total Fossil Fuel/Heat Equivalent and Electricity Sales, see Appendix E, Note 15. [11] Balancing item, the difference between Total Electricity Equivalent and Electricity Sales. [12] Less than 0.005 quadrillion Btu. [13] Preliminary. Note: Sum of components may not equal total due to independent rounding. Sources: Tables 86, 88, and 89 and conversion factors in Appendix A.

Figure 88. Fossil Fuels Consumed by Electric Utilities to Generate Electricity, 1949-1988



Source: See Table 88.

Table 88. Fossil Fuels Consumed by Electric Utilities To Generate Electricity, 1949-1988 [1]

Year	Coal		Natural Gas		Petroleum [2]		Total
	(million short tons)	(quadrillion Btu)	(billion cubic feet)	(quadrillion Btu)	(million barrels)	(quadrillion Btu)	(quadrillion Btu)
1949	84.0	2.00	550	0.57	66.3	0.41	2.98
1950	91.9	2.20	629	0.65	75.4	0.47	3.32
1951	105.8	2.51	764	0.79	63.9	0.40	3.70
1952	107.1	2.56	910	0.94	67.2	0.42	3.92
1953	115.9	2.78	1,034	1.07	82.2	0.51	4.36
1954	118.4	2.84	1,165	1.21	66.7	0.42	4.46
1955	143.8	3.46	1,153	1.19	75.3	0.47	5.12
1956	158.3	3.79	1,239	1.28	72.7	0.45	5.53
1957	160.8	3.86	1,336	1.38	79.7	0.50	5.74
1958	155.7	3.72	1,373	1.42	77.7	0.49	5.63
1959	168.4	4.03	1,629	1.69	88.3	0.55	6.27
1960	176.7	4.23	1,725	1.79	88.2	0.55	6.57
1961	182.2	4.35	1,825	1.89	88.9	0.56	6.80
1962	193.3	4.62	1,966	2.03	89.3	0.56	7.22
1963	211.3	5.05	2,144	2.21	93.3	0.58	7.85
1964	225.4	5.38	2,323	2.40	101.1	0.63	8.41
1965	244.8	5.82	2,321	2.40	115.2	0.72	8.94
1966	266.5	6.30	2,610	2.70	140.9	0.88	9.88
1967	274.2	6.44	2,746	2.83	161.3	1.01	10.29
1968	297.8	6.99	3,148	3.25	188.6	1.18	11.42
1969	310.6	7.22	3,488	3.60	251.0	1.57	12.39
1970	320.2	7.23	3,932	4.05	338.7	2.12	13.40
1971	327.3	7.30	3,976	4.10	399.5	2.49	13.89
1972	351.8	7.81	3,977	4.03	496.9	3.10	14.99
1973	389.2	8.66	3,660	3.75	562.8	3.51	15.92
1974	391.8	8.53	3,443	3.52	539.4	3.36	15.42
1975	406.0	8.79	3,158	3.24	506.5	3.17	15.19
1976	448.4	9.72	3,081	3.15	556.3	3.48	16.35
1977	477.1	10.26	3,191	3.28	624.2	3.90	17.45
1978	481.2	10.24	3,188	3.30	637.8	3.99	17.52
1979	527.1	11.26	3,491	3.61	524.6	3.28	18.16
1980	569.3	12.12	3,682	3.81	421.1	2.63	18.57
1981	596.8	12.58	3,640	3.77	351.8	2.20	18.55
1982	593.7	12.83	3,226	3.34	250.5	1.57	17.49
1983	625.2	13.21	2,911	3.00	246.8	1.54	17.75
1984	664.4	14.02	3,111	3.22	205.7	1.29	18.53
1985	693.8	14.54	3,044	3.16	174.6	1.09	18.79
1986	685.1	14.44	2,602	2.69	232.0	1.45	18.59
1987	717.9	15.17	2,844	2.94	199.4	1.26	19.37
1988[3]	756.8	15.84	2,634	2.72	248.0	1.56	20.12

[1] See Appendix E, Note 14.

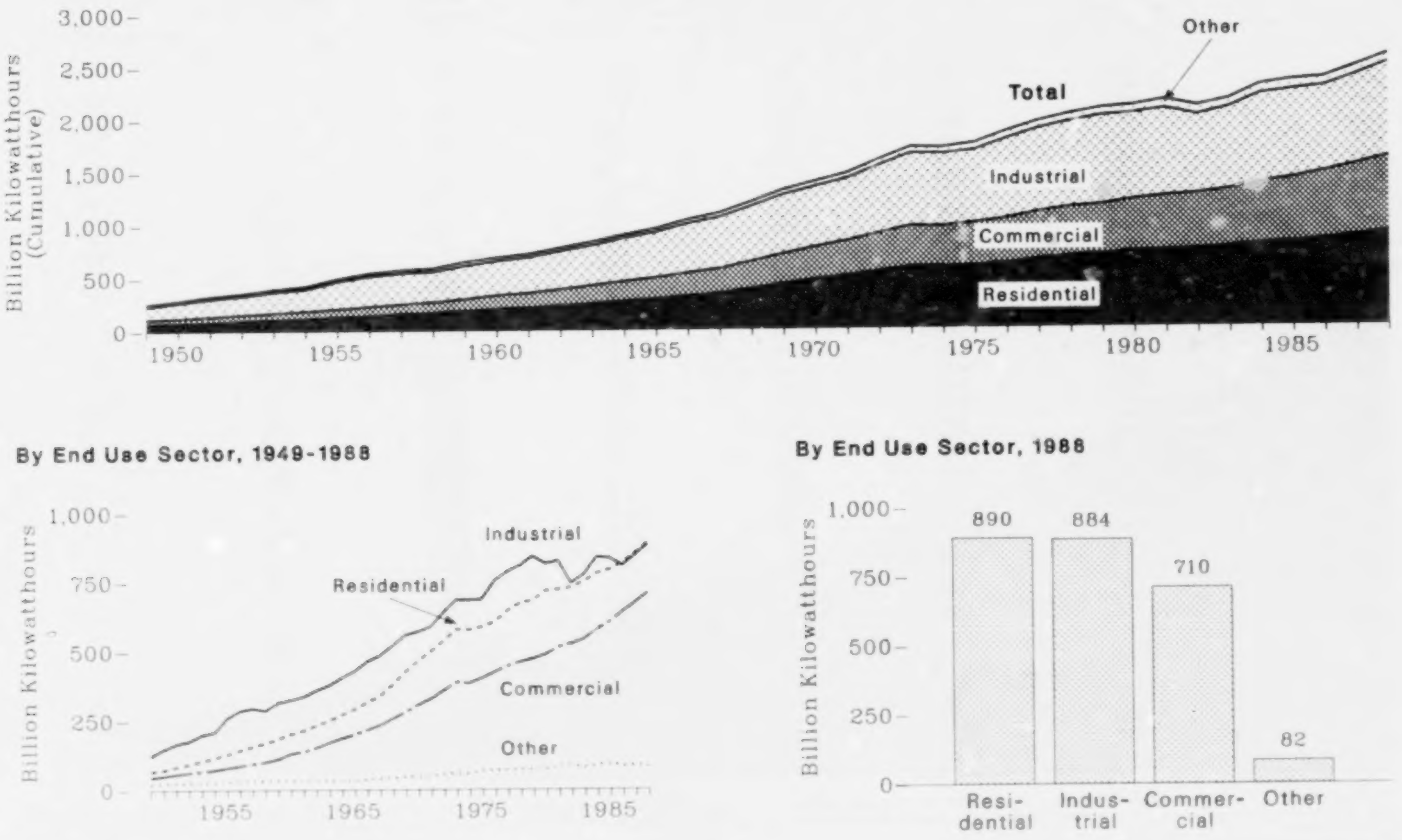
[2] These data are petroleum consumed by electric utilities and do not equate to petroleum supplied to (or delivered to) electric utilities. Included are residual fuel oil (including crude oil burned as fuel), distillate fuel oil, jet fuel, and petroleum coke, which is reported in short tons, and has been converted to barrels at a rate of 5 barrels per short ton.

[3] Preliminary.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1949 through September 1977—Federal Power Commission, Form 4, "Monthly Power Plant Report." •October 1977 through 1981—Federal Energy Regulatory Commission, FPC Form 4, "Monthly Power Plant Report." •1982 and forward—Energy Information Administration, Form EIA-759, "Monthly Power Plant Report."

Figure 89. Electricity Sales by End-Use Sector, 1949-1988



Note: 1949–1983 are "old series" data; 1984–1988 are "new series" data.
Source: See Table 89.

Table 89. Electricity Sales by End-Use Sector,[1] 1949-1988[2]

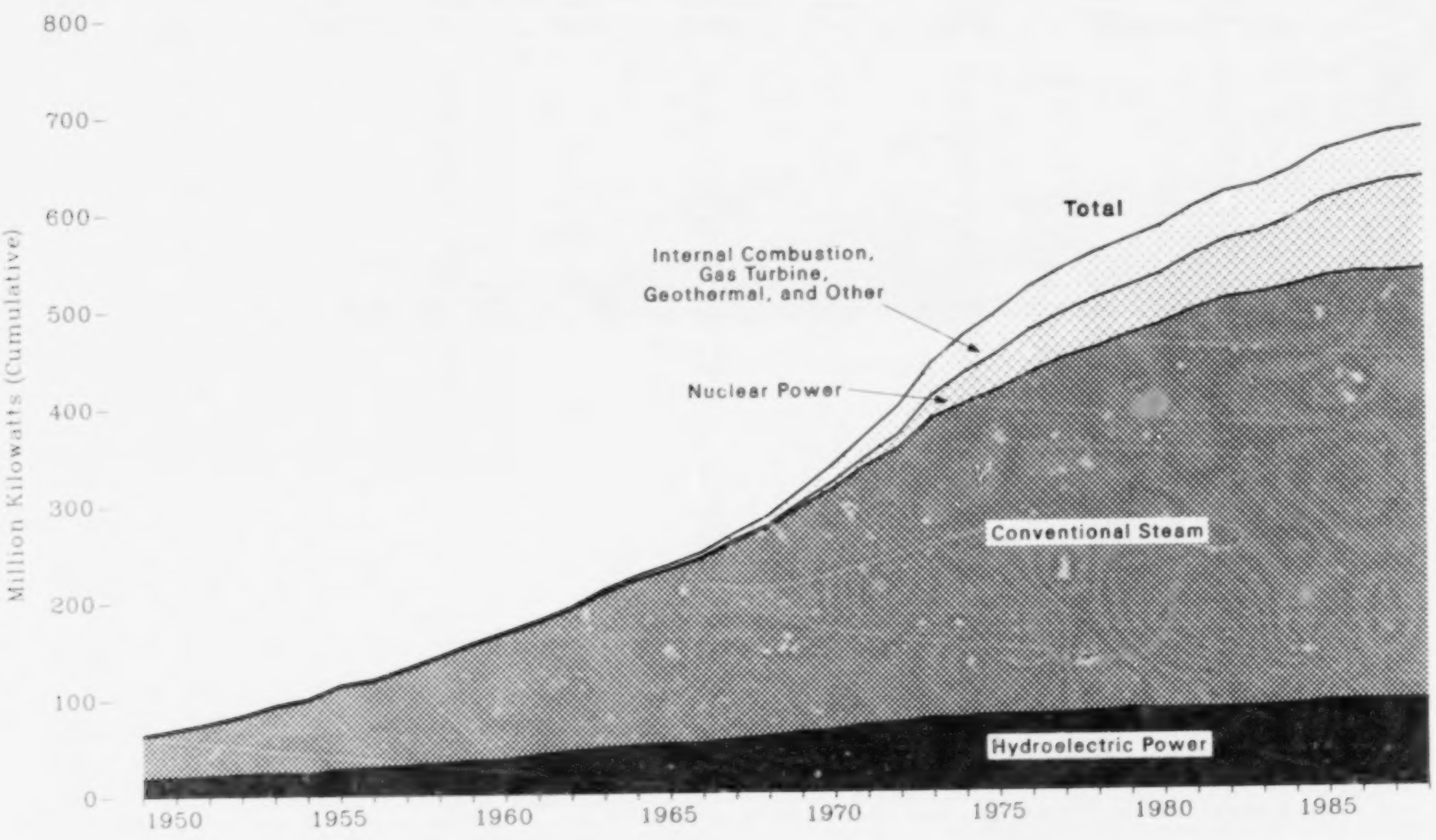
(Billion Kilowatthours)

Year	Residential		Commercial		Industrial		Other		Total	
	Old Series	New Series	Old Series	New Series	Old Series	New Series	Old Series	New Series	Old Series	New Series
1949	67	—	45	—	123	—	20	—	255	—
1950	72	—	51	—	146	—	22	—	291	—
1951	83	—	57	—	166	—	24	—	330	—
1952	94	—	62	—	176	—	24	—	356	—
1953	104	—	67	—	199	—	26	—	396	—
1954	116	—	72	—	208	—	27	—	424	—
1955	128	—	79	—	260	—	29	—	497	—
1956	143	—	87	—	286	—	30	—	546	—
1957	157	—	94	—	294	—	31	—	576	—
1958	169	—	100	—	287	—	32	—	588	—
1959	185	—	112	—	315	—	36	—	647	—
1960	201	—	131	—	324	—	32	—	688	—
1961	214	—	138	—	337	—	32	—	722	—
1962	233	—	153	—	360	—	32	—	778	—
1963	251	—	171	—	377	—	34	—	833	—
1964	272	—	187	—	405	—	32	—	896	—
1965	291	—	200	—	429	—	34	—	954	—
1966	317	—	218	—	464	—	37	—	1,035	—
1967	340	—	234	—	485	—	40	—	1,099	—
1968	382	—	258	—	521	—	42	—	1,203	—
1969	427	—	282	—	559	—	46	—	1,314	—
1970	466	—	307	—	571	—	48	—	1,392	—
1971	500	—	329	—	589	—	51	—	1,470	—
1972	539	—	359	—	641	—	56	—	1,595	—
1973	579	—	388	—	686	—	59	—	1,713	—
1974	578	—	385	—	685	—	58	—	1,706	—
1975	588	—	403	—	688	—	68	—	1,747	—
1976	606	—	425	—	754	—	70	—	1,855	—
1977	645	—	447	—	786	—	71	—	1,948	—
1978	674	—	461	—	809	—	73	—	2,018	—
1979	683	—	473	—	842	—	73	—	2,071	—
1980	717	—	488	—	815	—	74	—	2,094	—
1981	722	—	514	—	826	—	85	—	2,147	—
1982	730	—	526	—	745	—	86	—	2,086	—
1983	751	—	544	—	776	—	80	—	2,151	—
1984	778	[3] 780	578	[3] 577	841	[3] 839	82	[3] 89	2,278	[3] 2,285
1985	791	[3] 794	609	[3] 605	825	[3] 835	85	[3] 92	2,310	[3] 2,326
1986[4]	—	818	—	641	—	808	—	83	—	2,351
1987[4]	—	850	—	674	—	845	—	87	—	2,455
1988[4]	—	890	—	710	—	884	—	82	—	2,566

[1] See Appendix E, Note 16. [2] See Appendix E, Note 14. [3] Based on Form EIA-861, "Annual Electric Utility Report," which collects data from all electric utilities in the United States, American Samoa, Guam, Puerto Rico, and the Virgin Islands; values shown are for the United States only. [4] Beginning in January 1986, Form EIA-826 electricity sales estimates are based on a new sample and new expansion factors from data reported on Form EIA-861. These data are preliminary. Note: Sum of components may not equal total due to independent rounding.

Sources: **Old Series:** •1949 through September 1977—Federal Power Commission, FPC Form 5, "Monthly Statement of Electric Operating Revenue and Income." •October 1977 through February 1980—Federal Energy Regulatory Commission, FPC Form 5, "Monthly Statement of Electric Operating Revenue and Income." March 1980 through 1982—Federal Energy Regulatory Commission, FPC Form 5, "Electric Utility Company Monthly Statement." •1983 through 1985—Energy Information Administration, Form EIA-826, "Electric Utility Company Monthly Statement." **New Series:** 1984 and 1985—Energy Information Administration, Form EIA-861, "Annual Electric Utility Report." •1986—Energy Information Administration, Form EIA-826, "Electric Utility Company Monthly Statement." •1987 and 1988—Energy Information Administration, Form EIA-826, "Monthly Electric Utility Sales and Revenue Report with State Distributions."

Figure 90. Net Summer Capability of Electric Utilities, End of Year 1949–1988



Source: See Table 90.

Table 90. Net Summer Capability[1] of Electric Utilities, End of Year 1949-1988[2]

(Million Kilowatts)

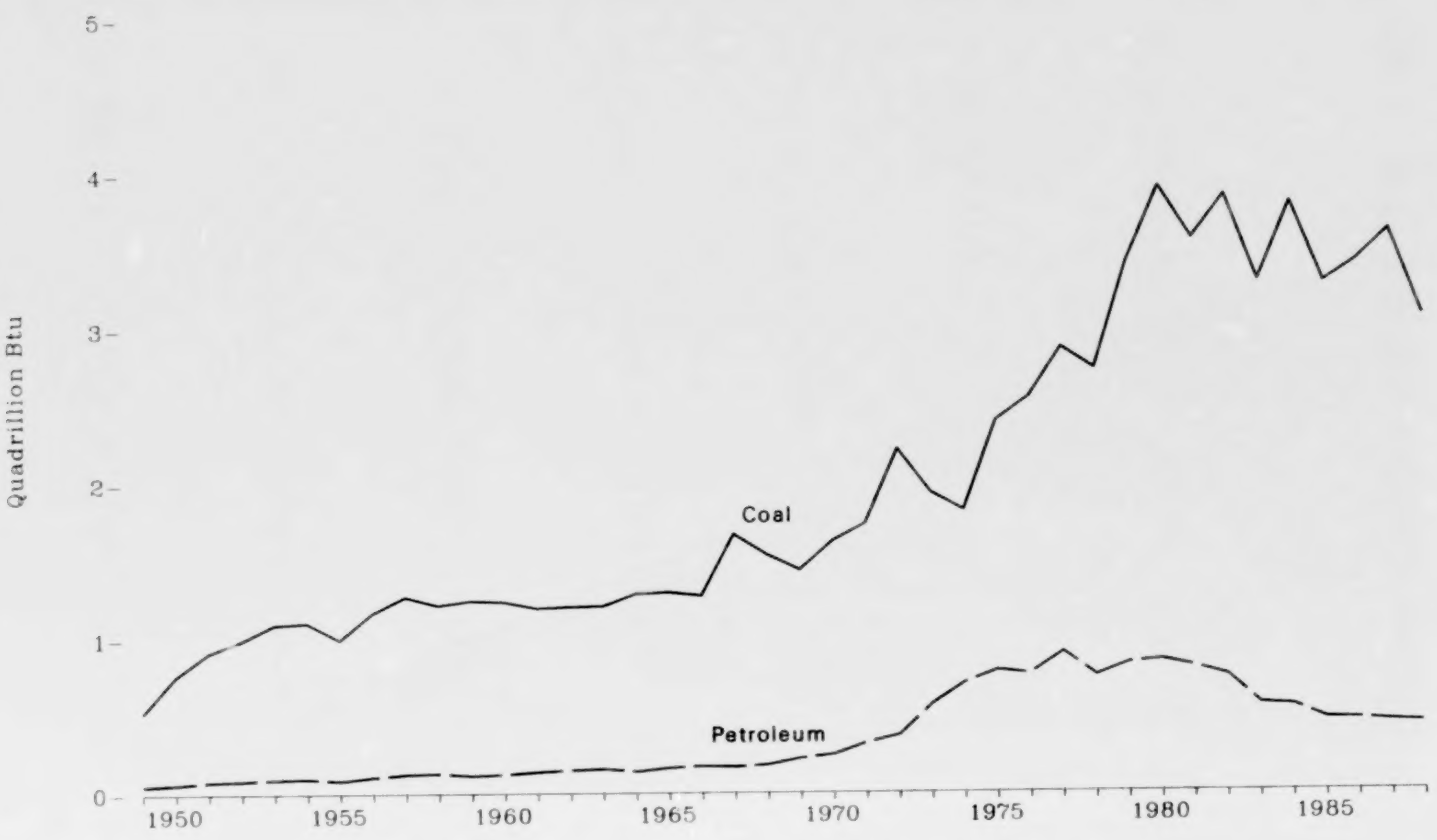
Year	Conventional Steam[3]	Internal Combustion	Gas Turbine	Nuclear Power	Hydroelectric Power	Geothermal and Other[4]	Total
1949	43.2	1.7	0	0	18.5	(5)	63.4
1950	48.2	1.8	0	0	19.2	(5)	69.2
1951	53.1	1.9	0	0	20.5	(5)	75.5
1952	58.8	2.0	0	0	22.4	(5)	83.2
1953	67.5	2.1	0	0	23.8	(5)	93.3
1954	75.4	2.2	0	0	22.5	(5)	100.0
1955	84.6	2.3	0	0	27.4	(5)	114.2
1956	88.8	2.4	0	0	28.5	(5)	119.7
1957	97.9	2.3	0	0.1	30.7	(5)	131.1
1958	108.2	2.4	0	0.1	32.5	(5)	143.3
1959	118.5	2.5	0	0.1	34.8	(5)	155.9
1960	128.3	2.6	0	0.4	35.8	(5)	167.1
1961	135.1	2.8	0	0.4	40.7	(5)	179.0
1962	144.6	2.8	0	0.7	44.0	(5)	192.1
1963	158.4	3.0	0.5	0.8	47.0	(5)	209.7
1964	169.6	3.1	0.8	0.8	49.4	(5)	223.7
1965	178.7	3.2	1.1	0.8	51.0	(5)	234.8
1966	189.6	3.3	1.6	1.7	51.2	(5)	247.5
1967	202.5	3.6	2.8	2.7	55.0	0.1	266.7
1968	214.3	3.8	5.3	2.7	57.9	0.1	284.0
1969	231.4	4.0	8.4	4.4	61.6	0.1	309.8
1970	248.0	4.1	13.3	7.0	63.8	0.1	336.4
1971	266.0	4.2	17.9	9.0	69.1	0.2	366.4
1972	282.3	4.5	23.9	14.5	70.5	0.3	396.0
1973	307.9	4.7	28.8	22.6	75.4	0.4	439.8
1974	322.4	4.7	33.7	31.8	75.5	0.4	468.5
1975	333.3	4.8	37.1	37.2	78.4	0.5	491.3
1976	350.9	5.0	39.1	43.7	78.0	0.5	517.2
1977	365.3	5.0	40.3	46.2	78.6	0.5	535.9
1978	374.5	5.2	41.2	50.7	79.9	0.5	552.1
1979	384.6	5.2	42.5	49.6	82.9	0.7	565.5
1980	396.6	5.2	42.5	51.7	81.7	0.9	578.6
1981	410.7	5.3	43.2	55.9	82.4	0.9	598.3
1982	421.4	4.8	43.5	59.9	83.0	1.1	613.7
1983	424.9	4.7	43.3	63.0	83.9	1.2	621.1
1984	430.8	4.5	43.5	69.7	85.3	1.3	635.1
1985	436.8	4.7	43.9	79.4	88.9	1.6	655.2
1986	440.6	4.6	43.4	85.2	89.3	1.6	664.8
1987	440.3	4.8	44.2	93.6	89.7	1.5	674.1
1988[6]	442.1	4.8	44.9	95.1	89.9	1.7	678.4

[1] See Glossary and Appendix E, Note 17.
[2] See Appendix E, Note 14.
[3] Includes fossil steam, wood, and waste.
[4] Other is wind, photovoltaic, and solar thermal energy.
[5] Less than 0.05 million kilowatts.
[6] Preliminary.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1949 through 1984—Energy Information Administration estimates. •1985 and forward—Energy Information Administration, Form EIA-860, "Annual Electric Generator Report."

Figure 91. Coal and Petroleum Stocks at Electric Utilities, End of Year 1949-1988



Source: See Table 91.

Table 91. Coal and Petroleum Stocks at Electric Utilities, End of Year 1949-1988 [1]

Year	Coal				Petroleum			
	Anthracite [2]	Bituminous Coal [3] and Lignite	Total		Oil [4]	Petroleum Coke [5]	Total	
	(million short tons)		(million short tons)	(trillion Btu)	(million barrels)		(million barrels)	(trillion Btu)
1949	4.3	17.8	22.1	524	8.6	NA	8.6	54
1950	4.7	27.1	31.8	762	10.2	NA	10.2	64
1951	5.1	33.4	38.5	913	12.8	NA	12.8	80
1952	5.6	35.9	41.5	991	13.7	NA	13.7	86
1953	5.9	39.8	45.6	1,094	15.0	NA	15.0	94
1954	6.4	39.7	46.1	1,106	15.9	NA	15.9	99
1955	3.2	38.2	41.4	996	13.7	NA	13.7	85
1956	2.8	46.0	48.8	1,168	17.3	NA	17.3	108
1957	2.8	50.3	53.1	1,273	20.1	NA	20.1	126
1958	2.2	48.8	51.0	1,218	20.8	NA	20.8	130
1959	2.0	50.1	52.1	1,247	18.5	NA	18.5	116
1960	1.8	49.9	51.7	1,238	19.6	NA	19.6	123
1961	1.5	48.6	50.1	1,197	22.0	NA	22.0	138
1962	1.4	49.0	50.4	1,205	23.8	NA	23.8	149
1963	1.3	49.3	50.6	1,209	24.9	NA	24.9	156
1964	1.2	52.7	53.9	1,286	22.4	NA	22.4	140
1965	1.1	53.4	54.5	1,297	25.6	NA	25.6	161
1966	1.0	52.9	53.9	1,274	27.4	NA	27.4	172
1967	1.3	69.7	71.0	1,669	26.7	NA	26.7	167
1968	1.3	64.2	65.5	1,538	28.7	NA	28.7	180
1969	1.3	60.6	61.9	1,438	35.3	NA	35.3	221
1970	1.1	70.8	71.9	1,623	38.0	1.2	39.2	245
1971	1.1	76.7	77.8	1,735	49.6	1.5	51.1	319
1972	0.9	98.8	99.7	2,214	57.7	1.4	59.1	368
1973	1.1	85.9	87.0	1,935	89.2	1.6	90.8	567
1974	0.9	82.6	83.5	1,819	112.9	0.2	113.1	705
1975	1.0	109.7	110.7	2,396	125.3	0.2	125.4	784
1976	1.0	116.4	117.4	2,546	121.7	0.2	121.9	762
1977	2.3	130.9	133.2	2,865	144.0	0.2	144.3	901
1978	2.2	126.0	128.2	2,728	118.8	1.0	119.8	749
1979	3.3	156.4	159.7	3,412	131.4	0.9	132.3	828
1980	4.7	178.3	183.0	3,897	135.4	0.3	135.6	848
1981	5.5	163.4	168.9	3,561	128.1	0.2	128.3	803
1982	6.1	175.1	181.1	3,839	118.9	0.2	119.1	745
1983	6.5	149.1	155.6	3,288	89.4	0.3	89.7	561
1984	6.7	173.0	179.7	3,792	87.6	0.3	87.9	549
1985	7.2	149.2	156.4	3,277	73.7	0.2	73.9	462
1986	7.1	154.7	161.8	3,412	73.1	0.2	73.3	459
1987	6.9	163.9	170.8	3,610	70.8	0.3	71.1	444
1988[6]	6.6	139.6	146.1	3,058	69.4	0.4	69.8	436

[1] See Appendix E, Note 14.

[2] Includes anthracite silt stored off-site.

[3] Includes subbituminous coal.

[4] Includes residual fuel oil (including crude oil burned as fuel), distillate fuel oil, and jet fuel.

[5] Petroleum coke, which is reported in short tons, has been converted to barrels at a rate of 5 barrels per short ton.

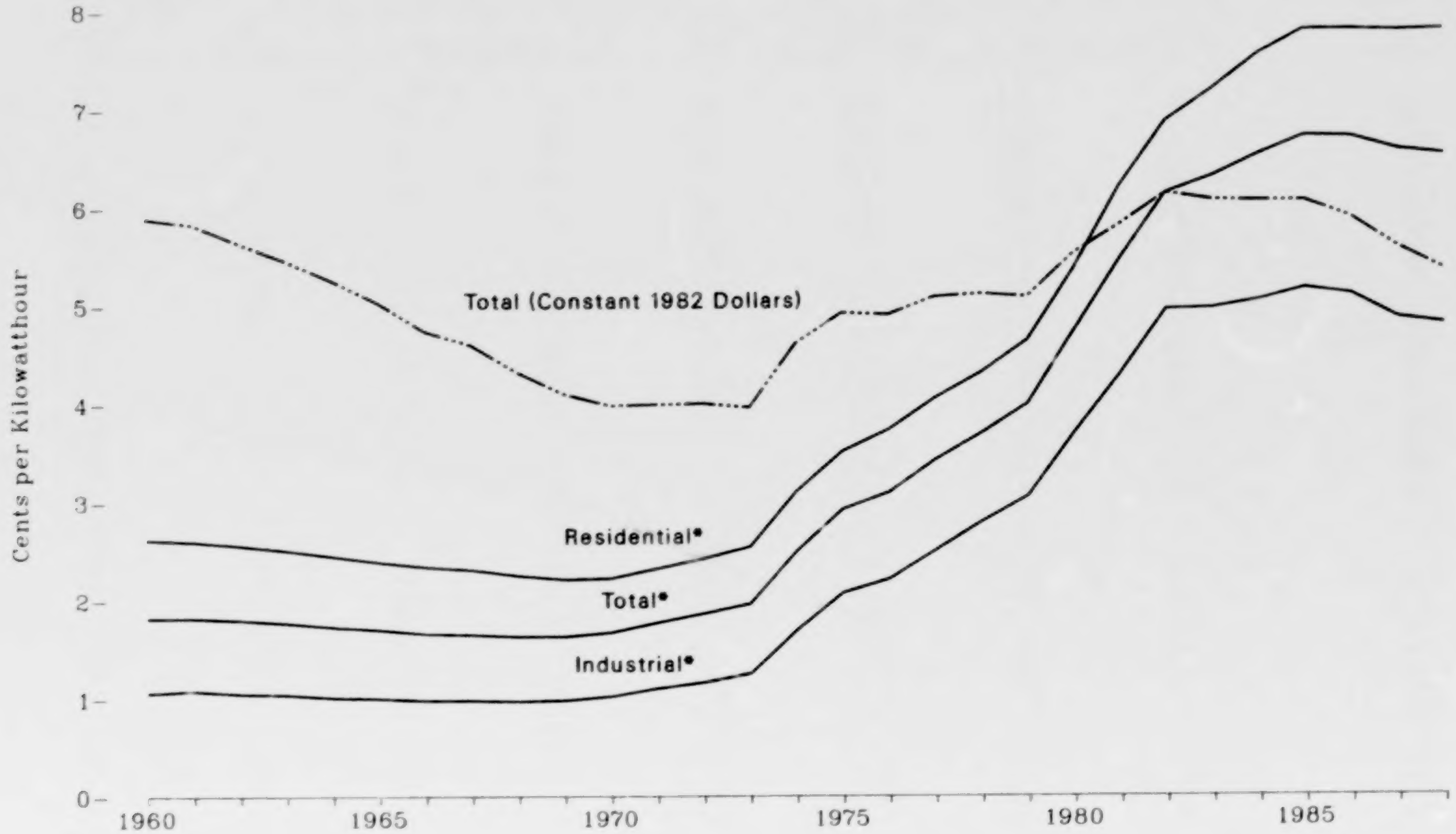
[6] Preliminary.

NA = Not available.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1949 through September 1977—Federal Power Commission, Form 4, "Monthly Power Plant Report." •October 1977 through 1981—Federal Energy Regulatory Commission, FPC Form 4, "Monthly Power Plant Report." •1982 and forward—Energy Information Administration, Form EIA-759, "Monthly Power Plant Report."

Figure 92. Retail Prices of Electricity Sold by Electric Utilities, 1960–1988



*Current dollars.
Note: All prices are "old series."
Source: See Table 92.

Table 92. Retail Prices of Electricity Sold by Electric Utilities,[1] 1960-1988

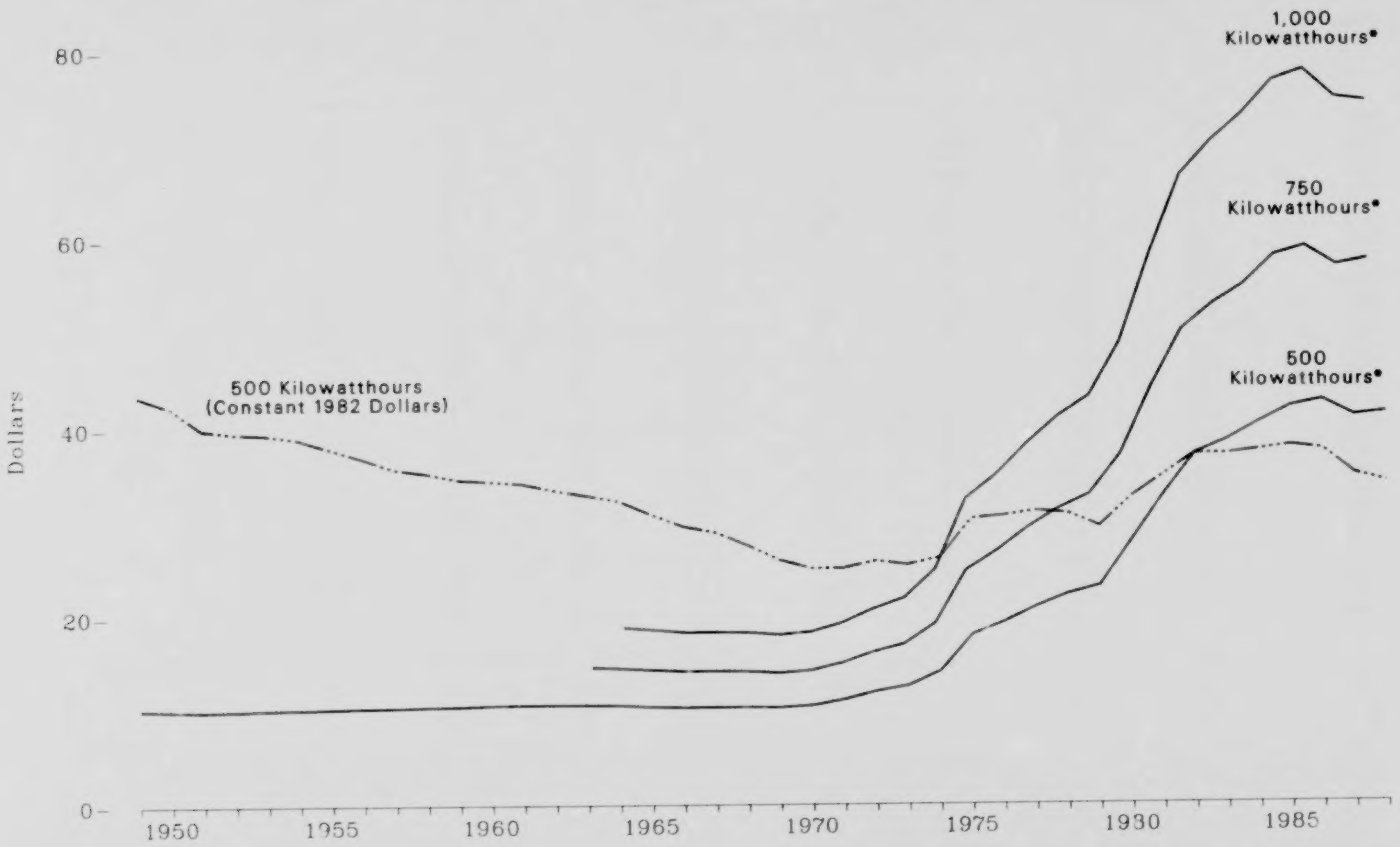
(Cents per Kilowatthour)

Year	Residential		Commercial		Industrial		Other		Total	
	Current	Constant[2]	Current	Constant[2]	Current	Constant[2]	Current	Constant[2]	Current	Constant[2]
					Old Series[3]					
1960	2.62	8.48	2.42	7.83	1.06	3.43	1.91	6.18	1.82	5.89
1961	2.60	8.33	2.43	7.79	1.08	3.46	1.83	5.87	1.82	5.83
1962	2.56	8.03	2.38	7.46	1.05	3.29	1.86	5.83	1.80	5.64
1963	2.51	7.75	2.34	7.22	1.04	3.21	1.83	5.65	1.77	5.46
1964	2.45	7.45	2.22	6.75	1.01	3.07	1.83	5.56	1.73	5.26
1965	2.39	7.07	2.18	6.45	1.00	2.96	1.82	5.38	1.70	5.03
1966	2.34	6.69	2.13	6.09	0.98	2.80	1.80	5.14	1.66	4.74
1967	2.31	6.43	2.11	5.88	0.98	2.73	1.76	4.90	1.65	4.60
1968	2.25	5.97	2.07	5.49	0.97	2.57	1.76	4.67	1.63	4.32
1969	2.21	5.55	2.06	5.18	0.98	2.46	1.74	4.37	1.63	4.10
1970	2.22	5.29	2.08	4.95	1.02	2.43	1.80	4.29	1.67	3.98
1971	2.32	5.23	2.20	4.95	1.10	2.48	1.91	4.30	1.77	3.99
1972	2.42	5.20	2.29	4.92	1.16	2.49	1.98	4.26	1.86	4.00
1973	2.54	5.13	2.41	4.87	1.25	2.53	2.10	4.24	1.96	3.96
1974	3.10	5.74	3.04	5.63	1.69	3.13	2.75	5.09	2.49	4.61
1975	3.51	5.92	3.45	5.82	2.07	3.49	3.08	5.19	2.92	4.92
1976	3.73	5.91	3.69	5.85	2.21	3.50	3.27	5.18	3.09	4.90
1977	4.05	6.02	4.09	6.08	2.50	3.71	3.51	5.22	3.42	5.08
1978	4.31	5.97	4.36	6.04	2.79	3.86	3.62	5.01	3.69	5.11
1979	4.64	5.90	4.68	5.95	3.05	3.88	3.96	5.04	3.99	5.08
1980	5.36	6.25	5.48	6.39	3.69	4.31	4.76	5.55	4.73	5.52
1981	6.20	6.60	6.29	6.69	4.29	4.56	5.28	5.62	5.46	5.81
1982	6.86	6.86	6.86	6.86	4.95	4.95	5.92	5.92	6.13	6.13
1983	7.18	6.91	7.02	6.76	4.96	4.77	6.38	6.14	6.30	6.06
1984	7.54	7.00	7.33	6.81	5.04	4.68	6.78	6.30	6.52	6.05
1985	7.79	7.02	7.47	6.74	5.16	4.65	6.96	6.28	6.71	6.05
1986	7.79	6.84	7.41	6.51	5.10	4.48	7.09	6.22	6.70	5.88
1987	7.78	6.61	7.25	6.16	4.86	4.13	7.01	5.96	6.57	5.58
1988[4]	7.79	6.40	7.15	5.88	4.80	3.94	6.82	5.60	6.52	5.36
					New Series[3]					
1986	7.41	6.51	7.13	6.26	4.90	4.30	6.64	5.83	6.42	5.64
1987	7.41	6.30	7.01	5.96	4.72	4.01	6.64	5.64	6.32	5.37
1988[4]	7.49	6.15	7.01	5.76	4.62	3.80	6.01	4.94	6.30	5.18

[1] Data 1979 and earlier are for Classes A and B privately owned electric utilities only. Data 1980 forward are for selected Class A utilities whose electric operating revenues were $100 million or more during the previous year. [2] In 1982 dollars, calculated using implicit GNP price deflators. See Appendix C. [3] Beginning with January 1986, national average price estimates are based on a statistically derived sample of both publicly and privately owned electric utilities. Prior to that time, national average price estimates were based on a sample of only privately owned electric utilities. Respondents to Form EIA-826, "Monthly Electric Utility Sales and Revenue Report with State Distributions," formerly the "Electric Utility Company Monthly Statement," consist of a sample of 201 electric utilities that were statistically chosen using stratification techniques. The respondents were chosen from more than 3,000 electric utilities reporting on Form EIA-861, "Annual Electric Utility Report." In 1988, the sample increased to 225 electric utilities. This scheme differs from the cut-off sample used prior to January 1986. Data are shown for both the old and new series. Publication of both series will continue until sufficient information exists to estimate historical data based on the new series. Data are preliminary. [4] Preliminary.

Sources: •1960 through September 1977—Federal Power Commision, Form 5, "Monthly Statement of Electric Operating Revenues and Income." •October 1977 through February 1980—Federal Energy Regulatory Commission, FPC Form 5, "Monthly Statement of Electric Operating Revenues and Income." •March 1980 through 1982—Federal Energy Regulatory Commission, Form 5, "Electric Utility Company Monthly Statement." •1983 through 1986—Energy Information Administration, Form EIA-826, "Electric Utility Company Monthly Statement." •1987 and 1988—Energy Information Administration, Form EIA-826, "Monthly Electric Utility Sales and Revenue Report with State Distributions."

Figure 93. Residential Weighted Average Monthly Electric Bills, 1949-1988



*Current dollars.
Source: See Table 93.

Table 93. Residential Weighted Average Monthly Electric Bills, 1949-1988
(Dollars)

Year	500 kWh[1]		750 kWh[2]		1,000 kWh[3]	
	Current	Constant[4]	Current	Constant[4]	Current	Constant[4]
1949	10.22	43.49	NA	NA	NA	NA
1950	10.11	42.30	NA	NA	NA	NA
1951	10.02	39.92	NA	NA	NA	NA
1952	10.08	39.53	NA	NA	NA	NA
1953	10.20	39.38	NA	NA	NA	NA
1954	10.23	38.90	NA	NA	NA	NA
1955	10.30	37.87	NA	NA	NA	NA
1956	10.36	36.87	NA	NA	NA	NA
1957	10.39	35.70	NA	NA	NA	NA
1958	10.47	35.25	NA	NA	NA	NA
1959	10.51	34.57	NA	NA	NA	NA
1960	10.62	34.37	NA	NA	NA	NA
1961	10.65	34.13	NA	NA	NA	NA
1962	10.66	33.42	NA	NA	NA	NA
1963	10.64	32.84	14.65	45.22	NA	NA
1964	10.61	32.25	14.51	44.10	18.86	57.33
1965	10.41	30.80	14.34	42.43	18.59	55.00
1966	10.34	29.54	14.19	40.54	18.32	52.34
1967	10.37	28.89	14.21	39.58	18.32	51.03
1968	10.37	27.51	14.16	37.56	18.27	48.46
1969	10.32	25.93	13.97	35.10	18.03	45.30
1970	10.51	25.02	14.22	33.86	18.31	43.60
1971	11.13	25.07	14.99	33.76	19.24	43.33
1972	11.99	25.78	16.14	34.71	20.70	44.52
1973	12.56	25.37	16.96	34.26	21.85	44.14
1974	14.10	26.11	19.14	35.44	24.85	46.02
1975	17.93	30.24	24.72	41.69	32.29	54.45
1976	19.26	30.52	26.78	42.44	34.85	55.23
1977	20.86	31.00	29.22	43.42	38.15	56.69
1978	22.19	30.73	31.23	43.25	40.98	56.76
1979	23.05	29.33	32.72	41.63	43.12	54.86
1980	27.80	32.44	36.94	43.10	48.79	56.93
1981	32.61	34.69	43.99	46.80	58.16	61.87
1982	36.96	36.96	50.07	50.07	66.39	66.39
1983	38.35	36.91	52.74	50.76	69.96	67.33
1984	40.18	37.31	54.76	50.84	72.77	67.57
1985	41.86	37.75	57.86	52.17	76.37	68.86
1986	42.54	37.35	58.79	51.62	77.50	68.04
1987	40.88	34.73	56.78	48.24	74.57	63.36
1988	41.21	33.86	57.39	47.16	74.15	60.93

[1] Weighted average monthly bill of residential consumers of 500 kilowatthours.

[2] Weighted average monthly bill of residential consumers of 750 kilowatthours.

[3] Weighted average monthly bill of residential consumers of 1,000 kilowatthours.

[4] In 1982 dollars, calculated using implicit GNP price deflators. See Appendix C.

NA = Not available.

Note: The U.S. average is calculated by multiplying the typical net bill for each community included in the community's population and dividing the sum of the products for all communities by the sum of their populations. Bills are based on rates in effect January 1 of each year.

Sources: •1949 through September 1977—Federal Power Commission, Form 3, "Typical Net Monthly Bills." •October 1977 through June 1979—Federal Energy Regulatory Commission, FPC Form 3, "Typical Net Monthly Bills." •July 1979 and forward—Energy Information Administration, Form EIA-213, "Typical Net Monthly Bills."

9. Nuclear Energy

Status of Nuclear Generating Units

At the end of 1988, there were 108 operable nuclear generating units in the United States (94).[1] Most of the units were located in the eastern half of the country. In addition, 3 units had reached the startup stage (authorization by the Nuclear Regulatory Commission for fuel loading and low-power testing) and 13 units had received construction permits. There were no units on order.

Although the number of operable units reached an all-time high in 1988, the total of 124 units in all stages of planning, construction, and operation was well below the total of 236 in 1975.[2] After 1975, many planned units were cancelled; after 1978, no orders for new units were announced.

Several factors contributed to the decline in the number of planned nuclear units. Growth in electricity demand was slower than expected. Longer leadtimes for licensing and construction coupled with higher financing expenses increased the cost of nuclear power plants, and rising interest rates and an uncertain economic environment further eroded electric utilities' willingness to commission new plants.

Contributions to Electricity Generation

Nuclear power's contribution to electricity generation in the United States increased almost every year from the mid-1960's through 1988; the exceptions were 1979 and 1980 (95). In 1988, 527 billion net kilowatthours (20 percent of total U.S. generation) came from nuclear power. Net summer capability, a measure of the steady hourly output that generating equipment is expected to supply to the system, also increased almost every year, reaching 95 million kilowatts by 1988.

The Uranium Industry

From 1949 through 1967, the Atomic Energy Commission (AEC) was the major purchaser of uranium. The AEC's demand for uranium for military purposes was strong during the 1950's and domestic production, spurred by AEC incentives, grew from 0.4 million pounds of uranium oxide (U_3O_8) in 1949 to 35 million pounds in 1960 (96). As the AEC began to accumulate stockpiles, its purchases declined and U.S. production fell to 21 million pounds in 1965.

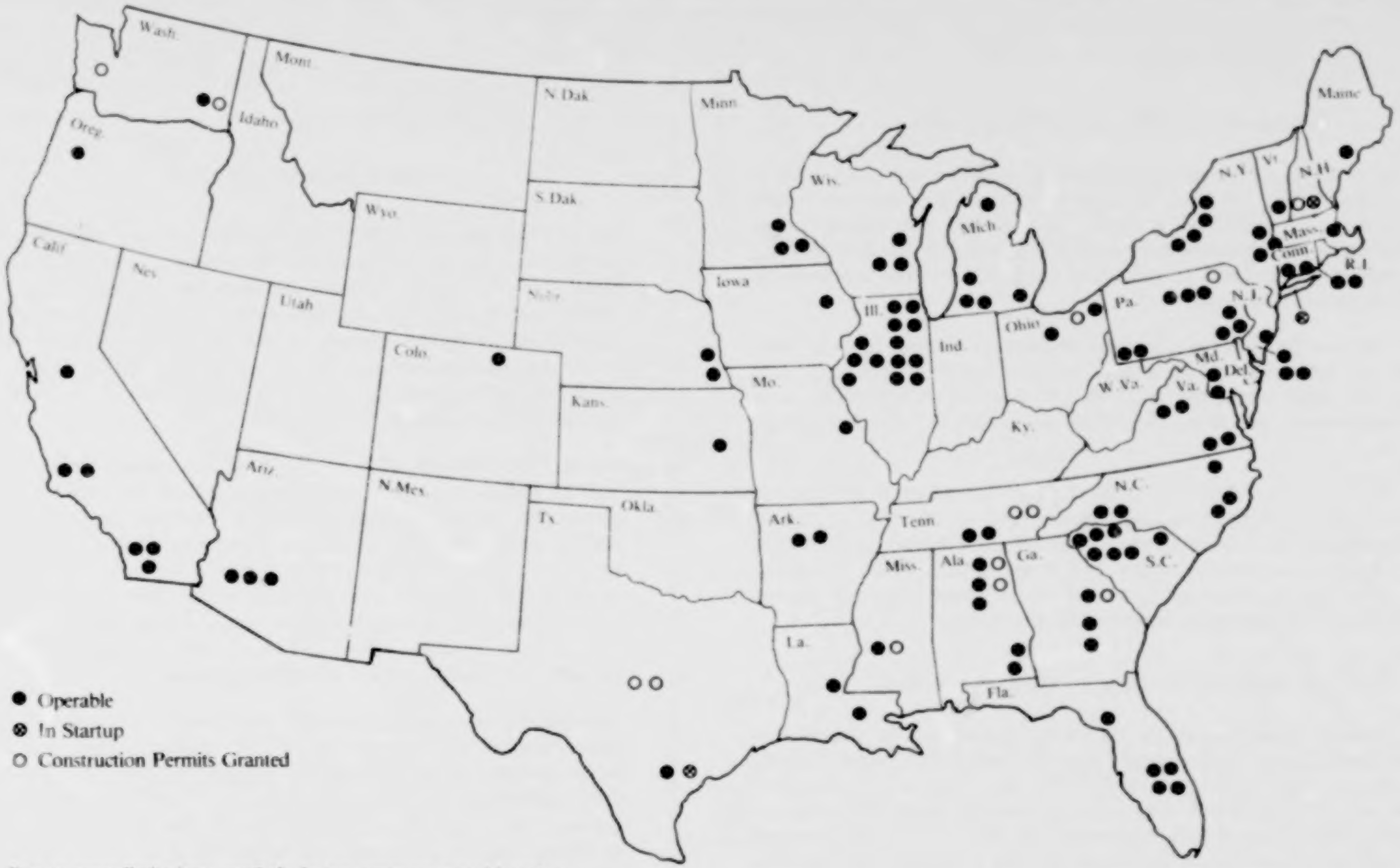
From 1966 through 1976, production fluctuated between 21 and 27 million pounds. Subsequently, orders for new nuclear plants led to strong growth, and production peaked at 44 million pounds in 1980. However, plant cancellations and postponements during the late 1970's led to a decline in projected demand and, coupled with buildups of inventories at electric utilities and foreign competition, caused the second major decline in production, which fell to 11 million pounds in 1985. In 1988, production totaled 13 million pounds.

Historically, domestic producers have faced competition from low-cost uranium imports. From 1949 through 1960, net imports actually exceeded domestic production (96). In 1966, the AEC effectively suspended imports by curtailing enrichment services for foreign uranium intended for use in domestic facilities, and no uranium was imported from 1968 through 1974. With the gradual removal of the AEC restrictions during the 1977-to-1983 period, foreign uranium deliveries to the United States increased. Contracts in place as of June 30, 1988, indicated net imports of 12 million pounds of U_3O_8 in 1988.

[1] Numbers in parentheses indicate related tables. Annual data are the most recent available and frequently are preliminary.

[2] Energy Information Administration, *Monthly Energy Review* December 1988, DOE/EIA-0035(88/12) (Washington, DC, March 1989), Table 8.2.

Figure 94. Status of Nuclear Generating Units, December 31, 1988


Wash.
Oreg.
Calif.
Idaho
Nev.
Mont.
Wyo.
Utah
Ariz.
Colo.
N.Mex.
N.Dak.
S.Dak.
Nebr.
Kans.
Okla.
Tx.
Minn.
Iowa
Mo.
Ark.
La.
Wis.
Ill.
Mich.
Ind.
Ohio
Ky.
Tenn.
Miss.
Ala.
Ga.
Fla.
S.C.
N.C.
Va.
W.Va.
Md.
Del.
Pa.
N.J.
N.Y.
Vt.
N.H.
Maine
Mass.
Conn.
R.I.

● Operable
⊗ In Startup
○ Construction Permits Granted

Due to space limitations, symbols do not represent actual locations.

Source: See Table 94.

Table 94. Status of Nuclear Generating Units, December 31, 1986, 1987, and 1988

(Number of Reactors)

Status	1986				1987				1988			
	Boiling Water Reactors	Pressurized Water Reactors	Other [1]	Total	Boiling Water Reactors	Pressurized Water Reactors	Other [1]	Total	Boiling Water Reactors	Pressurized Water Reactors	Other [2]	Total
Operable [3]	35	63	2	100	37	68	2	107	37	70	1	108
In Startup [4]	3	4	0	7	1	3	0	4	1	2	0	3
Construction Permits Granted	3	16	0	19	3	11	0	14	3	10	0	13
Construction Permits Pending	0	0	0	0	0	0	0	0	0	0	0	0
On Order	0	2	0	2	0	2	0	2	0	0	0	0
Total	41	85	2	128	41	84	2	127	41	82	1	124

[1] Includes one graphite-moderated and one gas-cooled reactor.

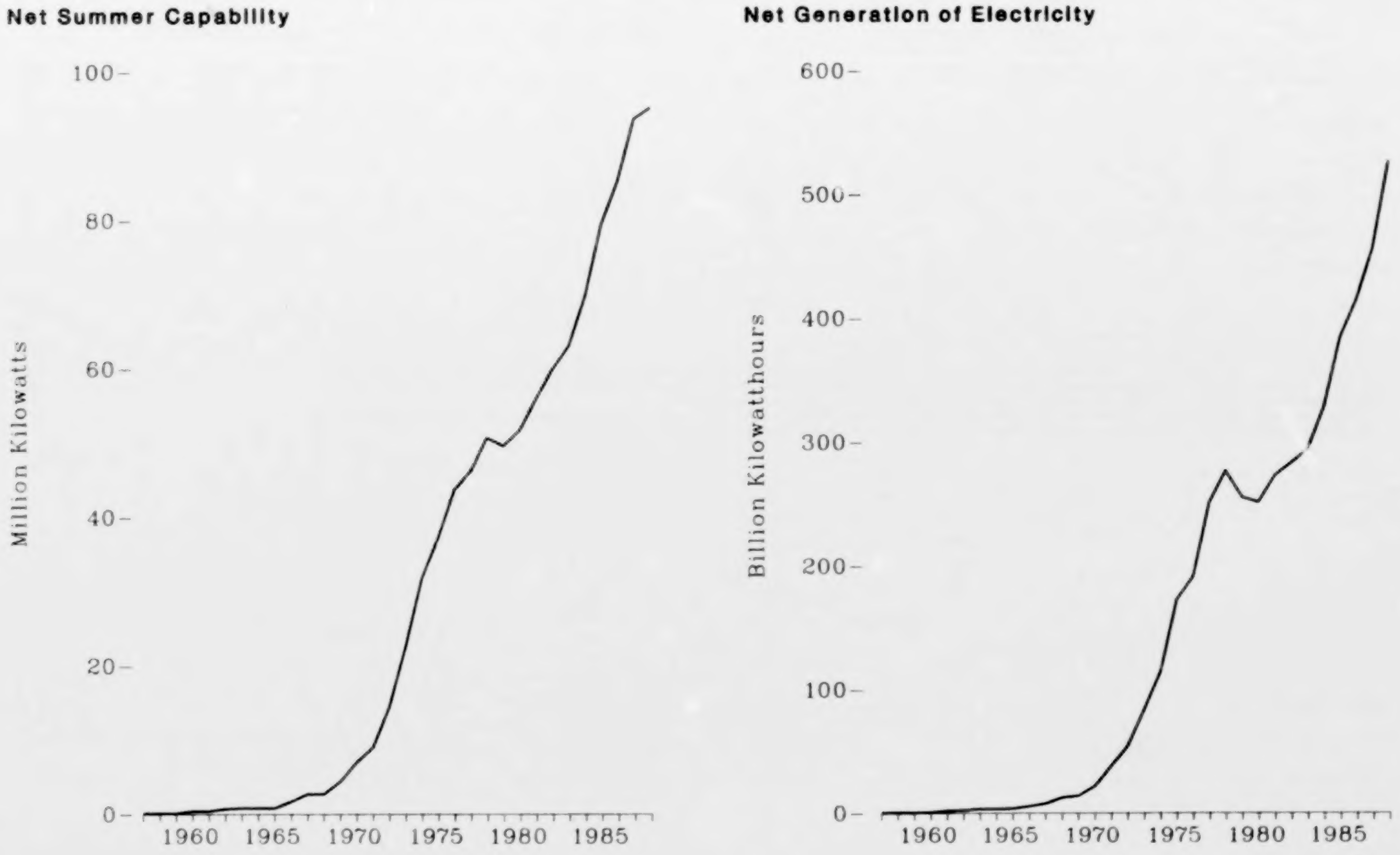
[2] High-temperature gas-cooled reactor.

[3] Units that have received a Full Power Operating License from the Nuclear Regulatory Commission plus the Hanford-N reactor for 1986 and 1987. The Hanford-N reactor was placed in a cold standby status by the U.S. Department of Energy in February 1988 and, consequently, is not included in the 1988 total. The Three Mile Island-2 reactor retains an operating license; however, there are no plans to resume operation of the unit, and it also is omitted from the 1988 total.

[4] Units that have received a Low Power Operating License from the Nuclear Regulatory Commission authorizing fuel loading and low-power testing.

Sources: Compiled by the Energy Information Administration from Nuclear Regulatory Commission sources.

Figure 95. Nuclear Generating Units Net Summer Capability and Net Generation of Electricity, 1957-1988



Net Summer Capability

Net Generation of Electricity

Source: See Table 95.

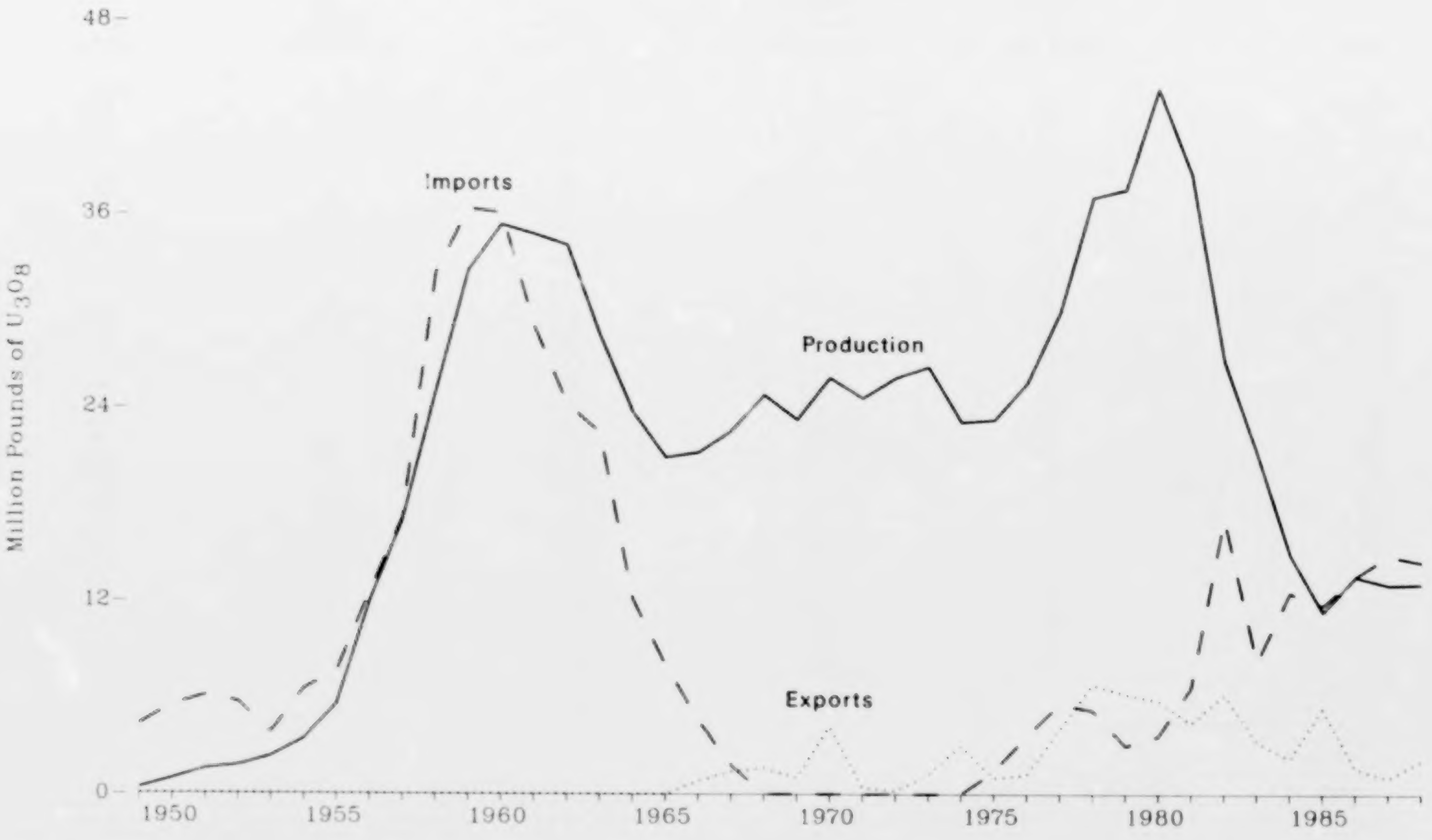
Table 95. Nuclear Generating Units Net Summer Capability [1] and Net Generation of Electricity, 1957-1988

Year	Operable Units [2] at End of Year	Net Summer Capability (million kilowatts)	Net Generation of Electricity (billion net kilowatthours)	Net Generation of Electricity (percent of total U.S. generation)	Capacity Factor [1]
1957	1	0.1	([3])	([4])	NA
1958	1	0.1	0.2	([4])	NA
1959	1	0.1	0.2	([4])	NA
1960	3	0.4	0.5	0.1	NA
1961	3	0.4	1.7	0.2	NA
1962	5	0.7	2.3	0.3	NA
1963	6	0.8	3.2	0.4	NA
1964	6	0.8	3.3	0.3	NA
1965	6	0.8	3.7	0.3	NA
1966	8	1.7	5.5	0.5	NA
1967	10	2.7	7.7	0.6	NA
1968	11	2.7	12.5	0.9	NA
1969	14	4.4	13.9	1.0	NA
1970	18	7.0	21.8	1.4	NA
1971	21	9.0	38.1	2.4	NA
1972	[2] 29	[2] 14.5	54.1	3.1	NA
1973	[2] 39	[2] 22.6	83.5	4.5	53.7
1974	48	31.8	114.0	6.1	47.9
1975	54	37.2	172.5	9.0	56.0
1976	61	43.7	191.1	9.4	54.9
1977	65	46.2	250.9	11.8	63.4
1978	70	50.7	276.4	12.5	64.7
1979	68	49.6	255.2	11.4	58.5
1980	70	51.7	251.1	11.0	56.4
1981	74	55.9	272.7	11.9	58.4
1982	77	59.9	282.8	12.6	56.7
1983	80	63.0	293.7	12.7	54.4
1984	86	69.7	327.6	13.6	56.3
1985	95	79.4	383.7	15.5	58.0
1986	100	85.2	414.0	16.6	56.9
1987	107	93.6	455.3	17.7	57.5
1988[5]	108	95.1	526.9	19.5	63.5

[1] See Glossary.
[2] See Appendix E, Note 18.
[3] Less than 0.05 billion kilowatthours.
[4] Less than 0.05 percent.
[5] Preliminary.
NA = Not available.

Sources: **Operable Units at End of Year:** •1957 through 1972—Federal Power Commission, Form 4, "Monthly Power Plant Report." •1973 and forward—Nuclear Regulatory Commission, Report NUREG-0020, *Licensed Operating Reactors*, monthly. **Net Summer Capability:** •1957 through 1983—See Appendix E, Note 17. •1984 and forward—Energy Information Administration, Form EIA-860, "Annual Electric Generator Report." **Electricity Generation.** •1957 through September 1977—Federal Power Commission, Form 4, "Monthly Power Plant Report." •October 1977 through 1981—Federal Energy Regulatory Commission, FPC Form 4, "Monthly Power Plant Report." •1982 and forward—Energy Information Administration, Form EIA-759, "Monthly Power Plant Report."

Figure 96. Uranium Concentrate Production, Exports, and Imports, 1949-1988



Source: See Table 96.

Table 96. Uranium Concentrate Production, Exports, and Imports, 1949-1988

(Million Pounds of U_3O_8)

Year	Domestic Production	Exports	Imports [1]
1949	0.36	0	4.3
1950	0.92	0	5.5
1951	1.54	0	6.1
1952	1.74	0	5.7
1953	2.32	0	3.8
1954	3.40	0	6.5
1955	5.56	0	7.6
1956	11.92	0	12.5
1957	16.96	0	17.1
1958	24.88	0	32.3
1959	32.48	0	36.3
1960	35.28	0	36.0
1961	34.70	0	29.0
1962	34.02	0	24.2
1963	28.44	0	22.4
1964	23.70	0	12.1
1965	20.88	0	8.0
1966	21.18	0.8	4.6
1967	22.51	1.4	1.8
1968	24.74	1.6	0
1969	23.22	1.0	0
1970	25.81	4.2	0
1971	24.55	0.4	0
1972	25.80	0.2	0
1973	26.47	1.2	0
1974	23.06	3.0	0
1975	23.20	1.0	1.4
1976	25.49	1.2	3.6
1977	29.88	4.0	5.6
1978	36.97	6.8	5.2
1979	37.47	6.2	3.0
1980	43.70	5.8	3.6
1981	38.47	4.4	6.6
1982	26.87	6.2	17.1
1983	21.16	3.3	8.2
1984	14.88	2.2	12.5
1985	11.31	5.3	11.7
1986	13.51	1.6	13.5
1987	12.99	1.0	14.8
1988[2]	13.03	2.1	14.4

[1] Import quantities through 1970 are reported for fiscal years. Prior to 1968 the Atomic Energy Commission was the sole purchaser of all imported U_3O_8.

[2] Preliminary.

Note: Import and export data prior to 1982 are for transactions conducted by uranium suppliers only. For 1982 forward, transactions by uranium buyers (consumers) are included. In 1983, buyer imports totalled 3,800 million pounds of U_3O_8 and buyer exports totalled 1,000 million pounds of U_3O_8. Buyer imports and exports prior to 1982 are believed to be small.

Sources: •1949 through 1967—U.S. Department of Energy, Grand Junction Area Office, Colorado, *Statistical Data of the Uranium Industry*, Report No. GJO-100, annual. •1968 through 1987—Energy Information Administration, *Uranium Industry Annual 1987*. •1988—Energy Information Administration, Form EIA-858, "Uranium Industry Annual Survey."

10. Renewable Energy

Emerging Sources of Renewable Energy

After World War II, the United States relied on petroleum, natural gas, and coal, which, in addition to having high Btu contents, were inexpensive, readily accessible, and easy to transport. During the early 1970's, however, increases in the prices of petroleum and natural gas, coupled with concerns about the stability of supply, stimulated interest in alternative sources of energy. Since 1973, renewable sources of energy have accounted for small but growing shares of the domestic energy market.

Some sources of renewable energy lend themselves to onsite applications such as the burning of wood for heat and the use of flat-plate solar thermal collectors for domestic hot water. Other sources, such as photovoltaics, can be used to generate electricity for transmission to distant markets. Although other sources with the potential for centralized applications, such as windmills, heliostats, and ocean thermal energy conversion, are not yet widely used, they may eventually contribute significantly to the domestic energy supply.

Wood and Other Biomass Energy

Energy derived from wood totaled 2.6 quadrillion Btu (97)[1] in 1984. Almost 1.7 quadrillion Btu of wood was consumed by the industrial sector. Industries with ready access to wood and wood byproducts, such as the paper and lumber industries, relied heavily on wood as an energy source. In the residential sector, wood supplied 0.9 quadrillion Btu and over 6 million households relied on wood as the main heating fuel (98).

Energy derived from other biomass sources, such as agricultural and solid wastes and alcohol fuels, totaled 0.3 quadrillion Btu in 1984 (97).

Solar Energy

Solar energy is an inexhaustible, universally available source of energy. Converting solar energy to useful forms, however, requires large collection areas, and therefore the amount that can be harnessed is limited.

Producer shipments of equipment are used as one measure of solar energy consumption. Shipments of low-temperature collectors, used primarily for heating swimming pools, reached 12 million square feet in 1980 and then declined each year thereafter, falling to 3.2 million square feet in 1987 (99). Shipments of medium-temperature, special, and other collectors, used primarily for domestic hot water, peaked at 12 million square feet in 1983, but fell to 1 million square feet in 1987 after the expiration of the Federal energy tax credit in 1985. Shipments of photovoltaic modules increased to 6.9 thousand peak kilowatts in 1987 (101).

Geothermal Energy

Most of the vast quantity of geothermal energy is inaccessible, trapped below the Earth's crust in layers of molten rock. However, when that energy reaches regions where the crust is thinner, it can be tapped. Hydrothermal reservoirs, the most common sources of geothermal energy, yield hot water or, more rarely, steam. Two other sources, geopressurized reservoirs and hot dry rock, are more difficult to harness.

Geothermal energy may be used directly, for purposes such as space heating, or it may be converted to electricity. In 1960, The Geysers in California became the first U.S. utility to generate electricity from geothermal steam. Subsequently, electricity generation from geothermal sources trended upward, even after 1982, when prices of conventional energy began to decline (102). In 1988, The Geysers and other, smaller plants generated 10 billion kilowatthours of electricity.

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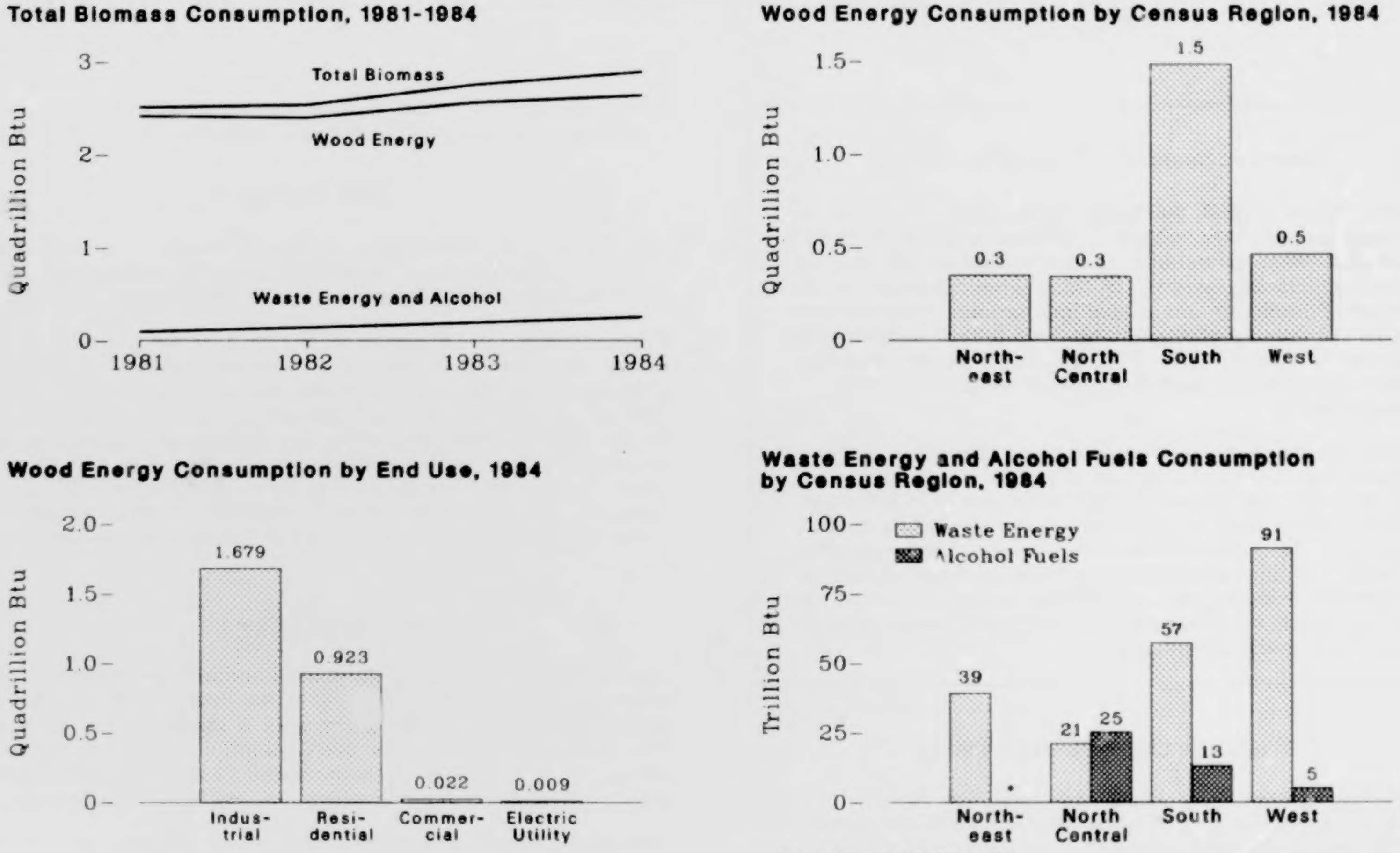
[1] Numbers in parentheses indicate related tables. Annual data are the most recent available and frequently are preliminary.

Figure 97. Consumption of Wood and Waste Energy and Alcohol Fuels



*Less than 0.5 trillion Btu.

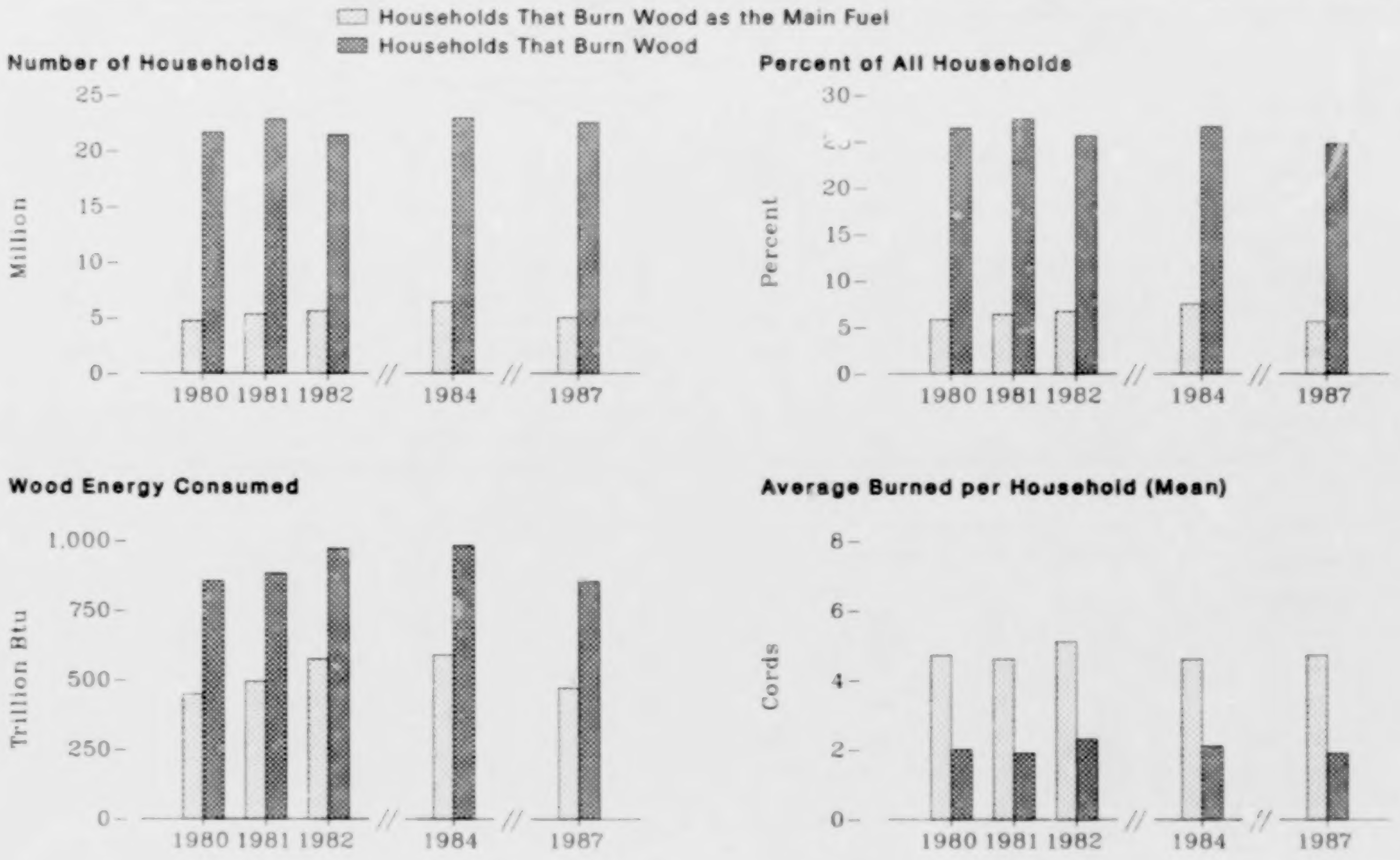
Note: See Appendix D for Census Regions.
Source: See Table 97.

Table 97. Consumption of Wood and Waste Energy and Alcohol Fuels by End-Use Sector and Census Region, 1980-1984

	1980		1981		1982		1983		1984	
	Million Short Tons [1]	Trillion Btu	Million Short Tons [1]	Trillion Btu	Million Short Tons [1]	Trillion Btu	Million Short Tons [1]	Trillion Btu	Million Short Tons [1]	Trillion Btu
Wood Energy										
End-Use Sector										
Industrial	93	1,600	88	1,519	83	1,434	93	1,606	98	1,679
Residential	50	859	51	869	55	937	54	925	54	923
Commercial	1	21	1	21	1	22	1	22	1	22
Electric Utility	(2)	4	(2)	3	(2)	2	(2)	3	1	9
Census Region [3]										
Northeast	22	386	22	389	20	351	21	369	20	349
North Central	19	329	20	331	20	339	18	318	20	341
South	80	1,380	75	1,291	78	1,334	86	1,471	86	1,482
West	23	388	23	402	22	372	23	396	27	461
Total	144	2,483	140	2,412	139	2,395	148	2,556	153	2,633
Waste Energy [4]										
Census Region [3]										
Northeast	NA	NA	NA	16	NA	20	NA	36	NA	39
North Central	NA	NA	NA	5	NA	13	NA	17	NA	21
South	NA	NA	NA	37	NA	50	NA	56	NA	57
West	NA	NA	NA	30	NA	36	NA	48	NA	91
Total	NA	NA	NA	88	NA	120	NA	157	NA	208
Alcohol Fuels										
Census Region [3]										
Northeast	NA	NA	NA	(5)	NA	(5)	NA	(5)	NA	(5)
North Central	NA	NA	NA	4	NA	11	NA	22	NA	25
South	NA	NA	NA	1	NA	4	NA	8	NA	13
West	NA	NA	NA	2	NA	4	NA	5	NA	5
Total	NA	NA	NA	7	NA	19	NA	35	NA	43
Total Biomass	NA	NA	NA	2,507	NA	2,534	NA	2,748	NA	2,884

[1] Oven-dried equivalent which averages approximately 17.2 million Btu per short ton.
[2] Less than 500,000 short tons.
[3] See Appendix D for Census regions.
[4] Includes landfill methane, mass burning, refuse derived fuels, and agricultural waste.
[5] Less than 0.5 trillion Btu.
NA = Not available.
Note: Sum of components may not equal total due to independent rounding.
Source: •1980—Energy Information Administration, *Estimates of U.S. Wood Energy Consumption, 1980-1983.* •1981 and forward—Energy Information Administration, previously unpublished data.

Figure 98. Households That Burn Wood, 1980–1982, 1984, and 1987



Source: See Table 98.

Table 98. Households That Burn Wood, 1980-1982, 1984, and 1987[1]

	1980	1981	1982	1984	1987
Households That Burn Wood					
Number of Households (millions)	21.6	22.8	21.4	22.9	22.5
Percent of All U.S. Households	26.4	27.4	25.6	26.6	24.8
Number of Cords Burned (millions)	42.7	44.0	48.6	49.0	42.6
Average Number of Cords Burned per Household					
Mean	2.0	1.9	2.3	2.1	1.9
Median	0.7	1.0	1.0	1.0	0.7
Wood Energy Consumed (trillion Btu)	854	881	971	981	853
Households That Burn Wood as Main Heating Fuel					
Number of Households (millions)	4.7	5.3	5.6	6.4	5.0
Percent of All U.S. Households	5.8	6.4	6.7	7.5	5.6
Number of Cords Burned (millions)	22.4	24.7	28.7	29.4	23.5
Average Number of Cords Burned per Household					
Mean	4.7	4.6	5.1	4.6	4.7
Median	3.3	3.0	4.0	4.0	4.0
Wood Energy Consumed (trillion Btu)	448	493	574	589	470

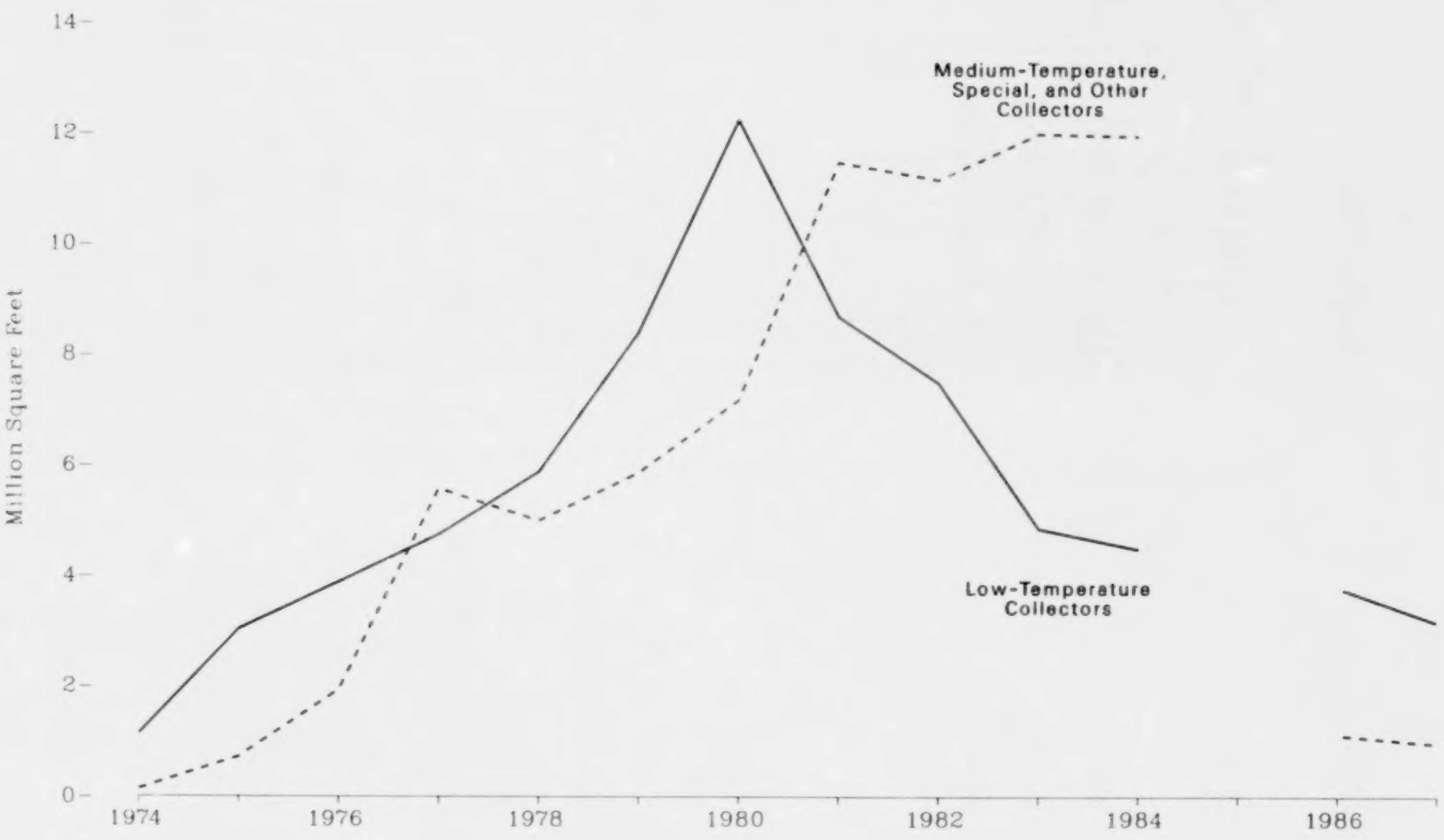
[1] Data are for the heating season beginning with the latter part of the previous year shown.

Note: Consumption estimates are based on respondent reports and may be subject to reporting biases.

Note: No data are available for 1983, 1985, and 1986.

Source: •1980 through 1982, 1984, and 1987—Energy Information Administration, Form EIA-457, "Residential Energy Consumption Survey."

Figure 99. Shipments of Solar Thermal Collectors, 1974-1984, 1986, and 1987



Note: Data were not collected for 1985.
Source: See Table 99.

Table 99. Shipments of Solar Thermal Collectors, 1974-1984, 1986 and 1987

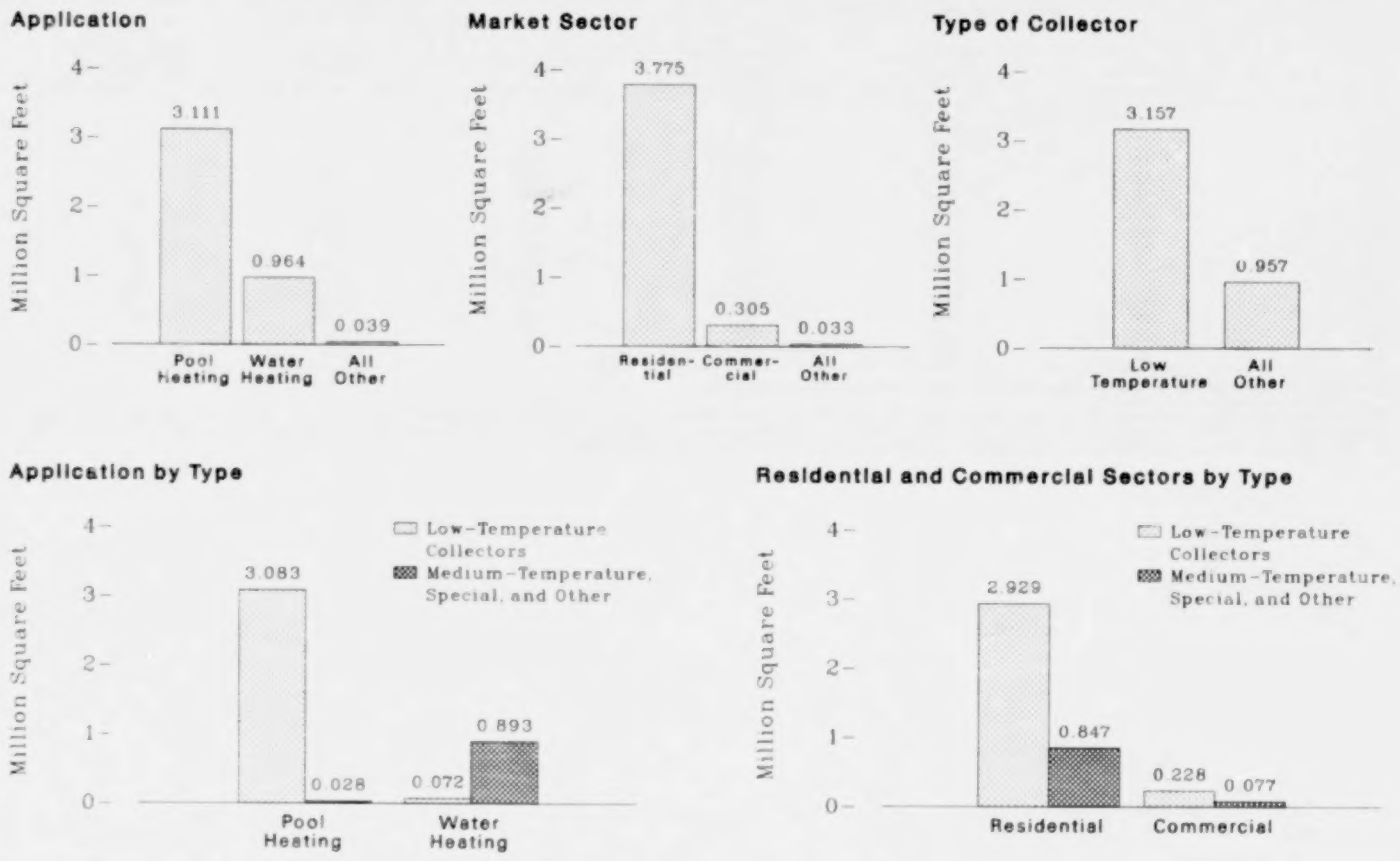
Year	Low-Temperature Collectors			Medium-Temperature, Special, and Other Collectors		
	Number of Manufacturers	Quantity Shipped (million square feet)	Average Shipments per Manufacturer (thousand square feet)	Number of Manufacturers	Quantity Shipped (million square feet)	Average Shipments per Manufacturer (thousand square feet)
1974	6	1.14	189.5	39	0.14	3.5
1975	13	3.03	232.8	118	0.72	6.1
1976	19	3.88	204.0	203	1.93	9.5
1977	52	4.74	91.2	297	5.57	18.8
1978	69	5.87	85.1	204	4.99	24.5
1979	84	8.39	100.0	257	5.86	22.8
1980	79	12.23	154.8	250	7.17	28.7
1981	75	8.68	115.7	263	11.46	43.6
1982	61	7.48	122.6	248	11.15	44.9
1983	55	4.85	88.2	179	11.98	66.9
1984	48	4.48	93.3	206	11.94	58.0
1986	22	3.75	170.5	87	1.11	12.8
1987	12	3.16	263.1	50	0.96	19.1

Note: Manufacturers producing more than one type of collector are accounted for in both groups.

Note: No data are available for 1985.

Sources: **Number of Manufacturers:** Energy Information Administration, "Annual Solar Thermal Collector Manufacturers Survey." **Other Data:** •1974 through 1976—Federal Energy Administration, *Solar Collector Manufacturing Activity*, semi-annual. •1977—Energy Information Administration, *Solar Collector Manufacturing Activity, July through December, 1981*, March 1982 (semi-annual). •1978 and forward—Energy Information Administration, *Solar Collector Manufacturing Activity*, annual.

Figure 100. Shipments of Solar Thermal Collectors by Type of Collector and End Use, 1987



Source: See Table 100.

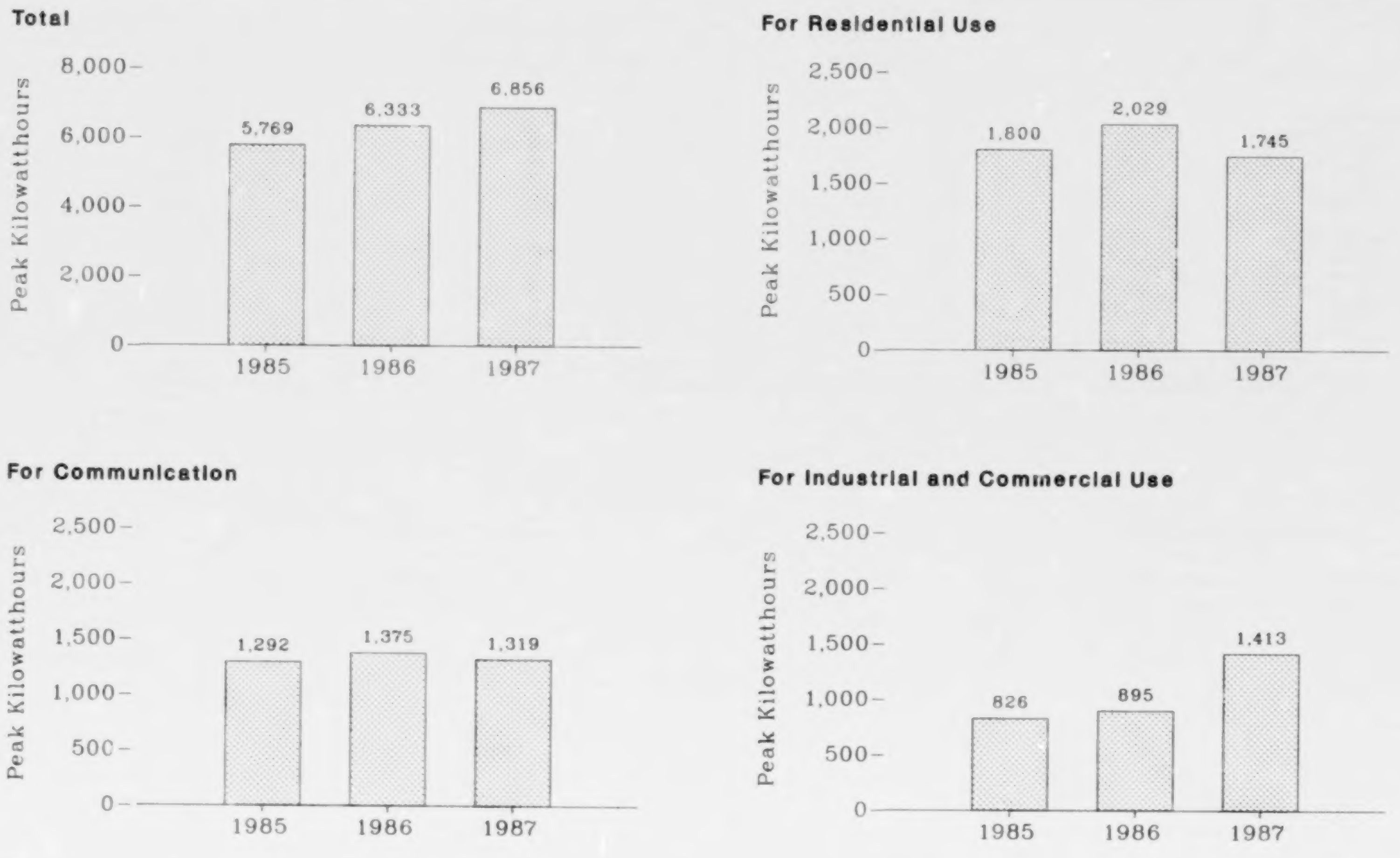
Table 100. Shipments of Solar Thermal Collectors by Type of Collector and End Use, 1987

(Thousand Square Feet)

End Use	Low-Temperature Collectors	Medium-Temperature, Special, and Other Collectors	Total
Application			
Pool Heating	3,083	28	3,111
Water Heating	72	893	964
Space Heating	W	W	23
Other	W	W	16
Total	3,157	957	4,114
Market Sector			
Residential	2,929	847	3,775
Commercial	228	77	305
Industrial	0	11	11
Other	0	22	22
Total	3,157	957	4,114

W = Value withheld to avoid disclosure of individual company data.
Note: Sum of components may not equal total due to independent rounding.
Source: Energy Information Administration, *Solar Collector Manufacturing Report 1987* (November 1988).

Figure 101. Photovoltaic Module Shipments by End Use, 1985–1987



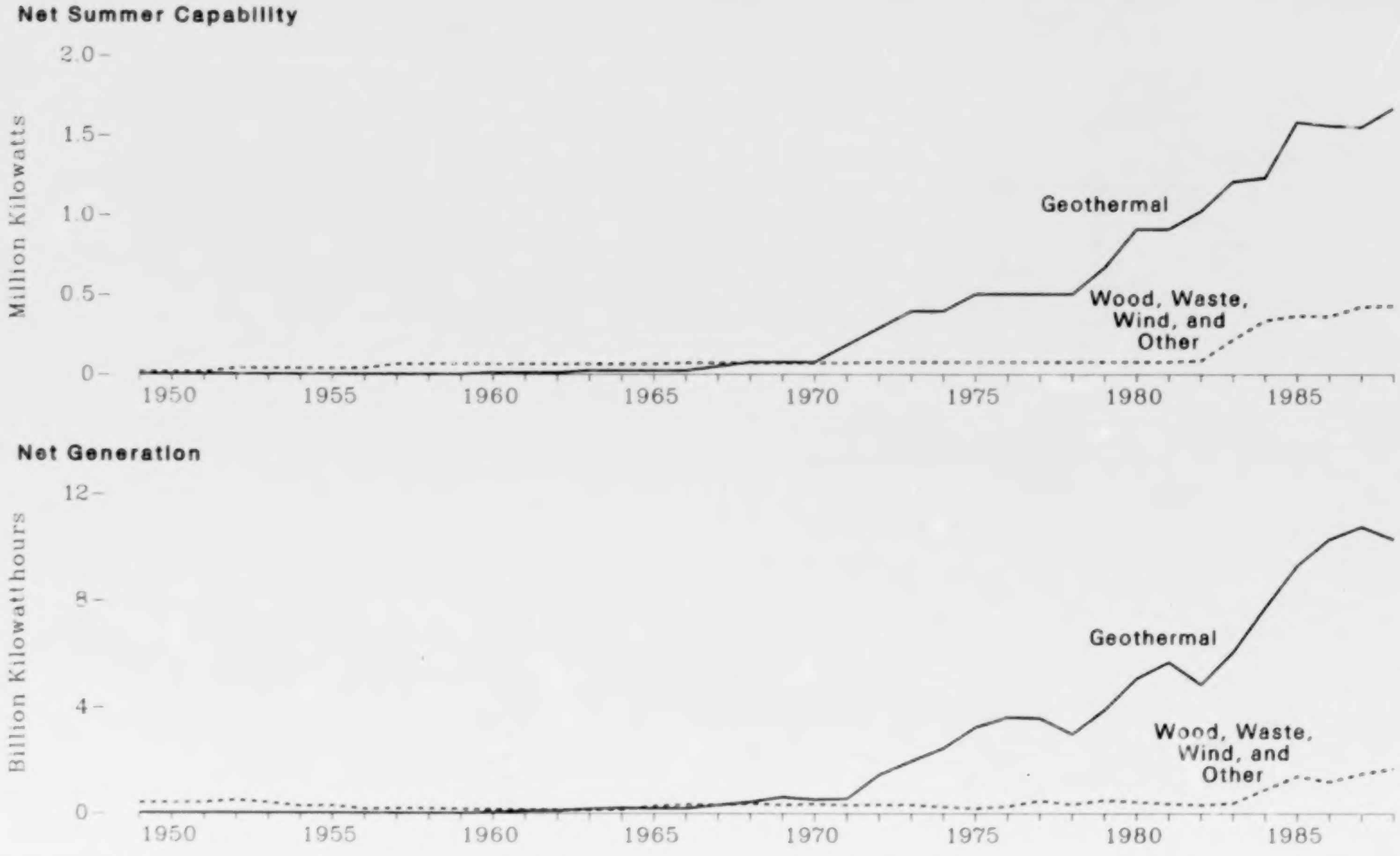
Source: See Table 101.

Table 101. Photovoltaic Module Shipments by End Use, 1985-1987

End Use	Amount Shipped (peak kilowatts)			Percent of Total		
	1985	1986	1987	1985	1986	1987
Water Pumping	545	591	438	9.4	9.3	6.4
Transportation	370	419	322	6.4	6.6	4.7
Communication	1,292	1,375	1,319	22.4	21.7	19.2
Consumer Goods	244	294	793	4.2	4.6	11.6
Military	112	101	W	1.9	1.6	W
Residential	1,800	2,029	1,745	31.2	32.0	25.5
Industrial and Commercial	826	895	1,413	14.3	14.1	20.6
Utility	518	553	534	9.0	8.7	7.8
Other	63	76	W	1.1	1.2	W
Total	5,769	6,333	6,856	100.0	100.0	100.0

W = Value withheld to avoid disclosure of individual company data.
Note: Sum of components may not equal total due to independent rounding.
Source: Energy Information Administration, *Solar Collector Manufacturing Activity*, annual.

Figure 102. Net Summer Capability and Net Generation of Electric Utility Electricity from Renewable Energy Resources, 1949-1988



Source: See Table 102.

Table 102. Net Summer Capability [1] and Net Generation of Electric Utility Electricity from Renewable Energy Resources, 1949-1988

Year	Geothermal		Wood and Waste		Wind and Other [2]	
	Net Summer Capability [3] (thousand kilowatts)	Net Generation (million kilowatthours)	Net Summer Capability [3] (thousand kilowatts)	Net Generation (million kilowatthours)	Net Summer Capability [3] (thousand kilowatts)	Net Generation (million kilowatthours)
1949	(4)	(4)	13	386	0	0
1950	(4)	(4)	13	390	0	0
1951	(4)	(4)	13	391	0	0
1952	(4)	(4)	37	482	0	0
1953	(4)	(4)	37	389	0	0
1954	(4)	(4)	37	263	0	0
1955	(4)	(4)	37	276	0	0
1956	(4)	(4)	37	152	0	0
1957	(4)	(4)	64	177	0	0
1958	(4)	(4)	64	175	0	0
1959	(4)	(4)	64	153	0	0
1960	11	33	64	140	NA	NA
1961	11	94	64	126	NA	NA
1962	11	100	64	128	NA	NA
1963	24	168	64	128	NA	NA
1964	24	204	64	148	NA	NA
1965	24	189	64	269	NA	NA
1966	24	188	72	334	NA	NA
1967	51	316	72	316	NA	NA
1968	78	436	72	375	NA	NA
1969	78	615	72	320	NA	NA
1970	78	525	72	356	NA	NA
1971	184	548	72	311	NA	NA
1972	290	1,453	77	331	NA	NA
1973	396	1,966	77	328	NA	NA
1974	396	2,453	77	251	NA	NA
1975	502	3,246	77	191	NA	NA
1976	502	3,616	77	266	NA	NA
1977	502	3,582	77	481	NA	NA
1978	502	2,978	77	338	NA	NA
1979	667	3,889	78	498	NA	NA
1980	909	5,073	78	433	NA	NA
1981	909	5,686	78	368	(5)	NA
1982	1,022	4,843	79	321	6	NA
1983	1,207	6,075	212	379	6	3
1984	1,231	7,741	321	886	17	12
1985	1,580	9,325	350	1,383	18	16
1986	1,558	10,308	343	1,177	19	18
1987	1,549	10,775	401	1,477	25	14
1988[6]	1,667	10,300	412	1,674	17	10

[1] See Glossary.
[2] Includes photovoltaic and solar thermal energy.
[3] At end of year.
[4] No geothermal capability prior to 1960.
[5] Less than 500 kilowatts.
[6] Preliminary.
NA = Not available.

Sources: **Net Summer Capability at End of Year:** •1960 through 1984—Energy Information Administration estimates. •1985 and forward—Energy Information Administration, Form EIA-860, "Annual Electric Generator Report." **Net Generation:** •1949 through September 1977—Federal Power Commission, Form 4, "Monthly Power Plant Report." •October 1977 through 1981—Federal Energy Regulatory Commission, FPC Form 4, "Monthly Power Plant Report." •1982 and forward—Energy Information Administration, Form EIA-759, "Monthly Power Plant Report."

11. International Energy

The Rise and Fall of Crude Oil Prices

In the mid-1970's, oil-producing nations became able, for the first time, to exploit the relative inelasticity of petroleum demand in the short term by raising prices substantially. By the 1980's, however, the effects of conservation, fuel switching, and increased efficiency had begun to inhibit demand, even as higher prices stimulated new sources of production. Crude oil prices declined slowly at first and then plunged in 1986, as netback pricing supported excess production. Prices recovered only moderately in 1987 before declining again in 1988.

Fluctuations in Petroleum Demand

The expanding post-World War II petroleum market reached 56 million barrels per day in 1973 (108).[1] Following the 1973 price hike, demand dipped and then grew slowly to a peak of 65 million barrels per day in 1979. After the 1979–80 price hike, world petroleum consumption began to fall, down to 59 million barrels per day by 1983. At that point, lowered demand and excess production began to erode the price of oil. In 1986, consumption was up to 61 million barrels per day.

U.S. consumption of petroleum products in 1986 accounted for 16 million barrels per day out of the 35 million barrels per day consumed by the Organization for Economic Cooperation and Development (OECD) countries. Japan consumed 4 million barrels per day. Of the non-OECD countries, the U.S.S.R. was the biggest consumer, accounting for 9 million barrels per day.

Energy Production by Source

World production of crude oil totaled 58 million barrels per day in 1988, up 4 percent from the 1987 level (105). Production gains in Saudi Arabia and Iraq more than offset cut-backs in the United States, the United Kingdom, and Iran. The Organization of Petroleum Exporting Countries (OPEC) accounted for 35 percent, and the U.S.S.R. and the United States, combined, for 34 percent, of world production.

In 1987, the U.S.S.R. and the United States were the major producers of dry natural gas (110). Together, they accounted for 42 trillion cubic feet out of the world total of 67 trillion cubic feet.

Coal production rose from 3.8 billion short tons in 1977 to 5.1 billion short tons in 1987 (113). China, the leading producer, boosted production to 1.0 billion short tons in 1987. The United States, the second leading producer, mined 917 million short tons.

In 1988, nuclear-based electricity generation by non-Communist countries reached 1.6 trillion kilowatthours (115). The U.S. share of the world total rose to 35 percent. France accounted for 17 percent, Japan for 11 percent, and West Germany for 9 percent of the world total.

World Leaders in Energy Production

Worldwide energy production of 321 quadrillion Btu in 1987 was 53 quadrillion Btu greater than in 1977 (103). The U.S.S.R. accounted for 19 quadrillion Btu of the world increase and, in 1986, the U.S.S.R.'s production (66 quadrillion Btu) surpassed U.S. production (64 quadrillion Btu) for the first time. China contributed almost 10 quadrillion Btu to the increase in world supply and, in 1982, became the third largest energy producer. Production in the United Kingdom rose from 7 quadrillion Btu in 1977 to 10 quadrillion Btu in 1987.

In contrast, Middle Eastern countries cut back production of energy (primarily petroleum) from 50 quadrillion Btu in 1977 to 26 quadrillion Btu in 1985 in an effort to regain control of world oil markets. Saudi Arabia registered a substantial decline, from 21 quadrillion Btu in 1977 to 9 quadrillion Btu in 1985, before increasing production to 12 quadrillion Btu in its 1986 attempt to regain market share.

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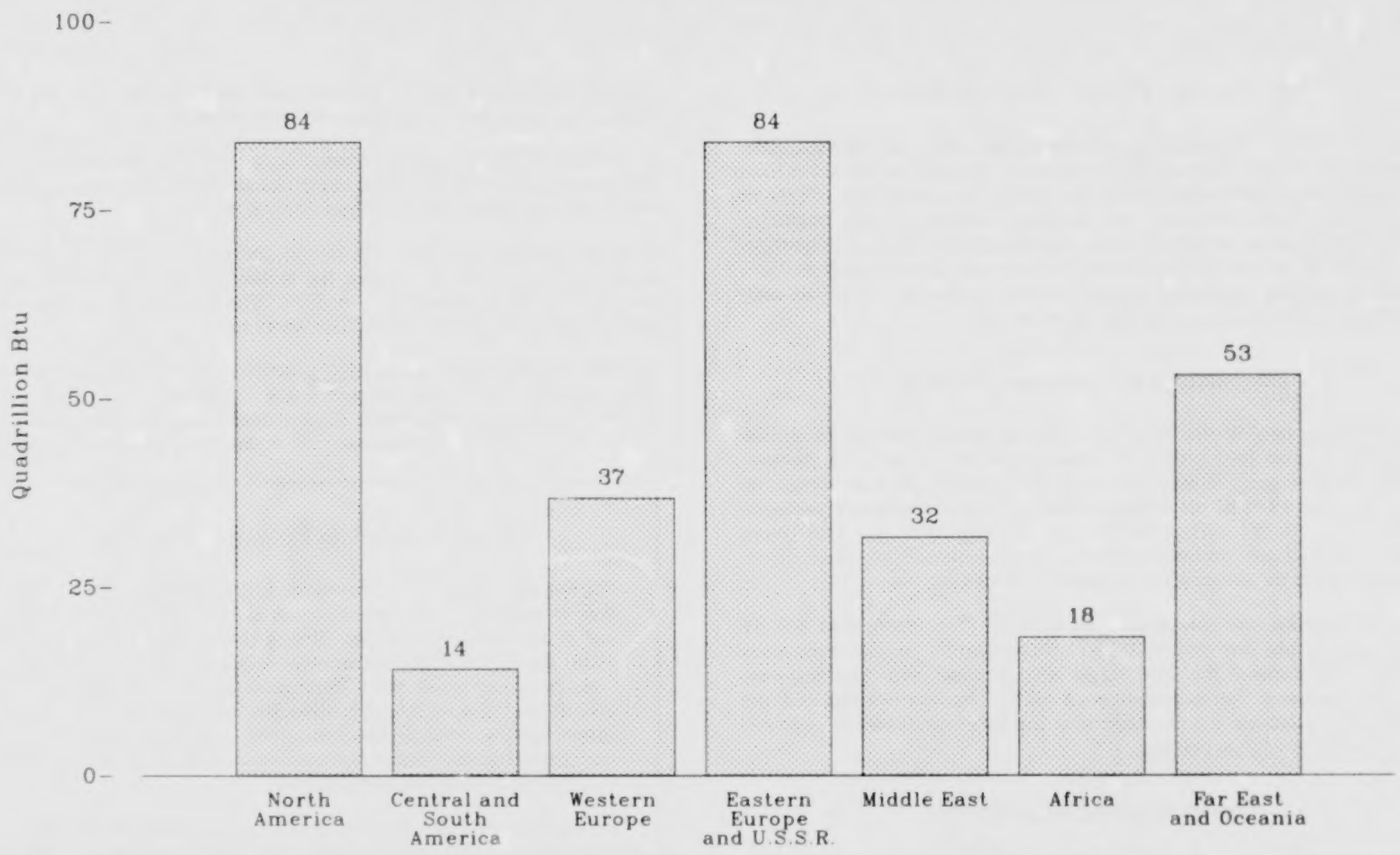
[1] Numbers in parentheses indicate related tables. Annual data are the most recent available and frequently are preliminary.

Figure 103. World Primary Energy Production by Area and Country, 1987



Source: See Table 103.

Table 103. World Primary Energy Production [1] by Area and Country, 1977-1987

(Quadrillion Btu)

Area and Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987 [a]
North, Central, and South America											
Canada	9.03	9.14	9.99	10.04	9.75	9.64	10.11	10.98	11.76	11.67	12.17
Mexico	3.14	3.76	4.51	5.80	6.78	7.82	7.70	7.88	7.74	7.15	7.38
United States	60.14	61.03	63.71	64.64	64.30	63.79	61.08	65.67	64.55	63.99	64.35
Venezuela	5.69	5.52	6.04	5.71	5.58	5.22	4.99	5.02	4.77	5.14	5.09
Other	5.18	5.66	6.19	6.44	6.56	6.82	7.22	8.11	8.66	8.94	8.99
Total	83.18	85.11	90.44	92.63	93.97	93.29	91.11	97.66	97.48	96.89	97.98
Western Europe											
France	2.00	2.02	2.03	2.26	2.65	2.62	2.97	3.38	3.56	3.82	3.94
Netherlands	2.90	2.49	2.69	3.32	3.10	2.67	2.62	2.71	2.82	2.71	2.78
Norway	1.47	2.07	2.68	3.02	3.06	3.11	3.41	3.65	3.82	3.97	4.43
United Kingdom	6.58	7.19	8.24	8.40	8.71	9.49	9.92	8.86	10.18	10.63	10.47
West Germany	5.12	5.12	5.44	5.44	5.57	5.72	5.53	5.73	6.03	5.77	5.79
Other	5.86	5.93	6.31	6.21	6.63	7.04	7.42	8.00	8.50	8.86	9.32
Total	23.93	24.81	27.40	28.65	29.73	30.65	31.86	32.33	34.91	35.76	36.73
Eastern Europe and U.S.S.R.											
East Germany	2.30	2.32	2.36	2.44	2.53	2.57	2.66	2.81	2.96	2.91	2.93
Poland	5.18	5.36	5.51	5.28	4.54	5.16	5.25	5.37	5.54	5.72	5.86
Romania	2.48	2.34	2.47	2.47	2.54	2.65	2.67	2.72	2.64	2.73	2.69
U.S.S.R.	49.79	52.11	53.88	55.67	56.71	58.27	59.96	62.00	63.81	66.38	68.46
Other	3.20	3.27	3.30	3.34	3.35	3.53	3.61	3.61	3.69	3.75	3.90
Total	62.95	65.40	67.52	69.20	69.67	72.18	74.15	76.51	78.64	81.49	83.84
Middle East											
Iran	12.88	11.93	7.46	3.91	3.28	5.12	5.67	5.29	5.57	5.06	5.94
Iraq	5.08	5.53	7.49	5.45	2.16	2.19	2.17	2.61	3.09	3.66	4.55
Kuwait	4.46	4.90	5.78	3.88	2.70	1.98	2.51	2.76	2.44	3.36	3.23
Saudi Arabia	20.51	18.45	21.24	22.48	22.57	14.86	11.69	11.29	8.55	11.91	10.56
United Arab Emirates	4.45	4.09	4.12	3.89	3.45	3.00	2.91	3.00	3.29	3.68	4.12
Other	2.39	2.40	2.56	2.52	2.57	2.39	2.34	2.71	2.73	2.96	3.14
Total	49.77	47.30	48.65	42.13	36.73	29.54	27.29	27.66	25.67	30.63	31.54
Africa											
Algeria	2.63	3.28	3.16	2.75	2.95	3.11	3.46	3.71	3.77	3.56	3.75
Libya	4.53	4.40	4.63	4.03	2.57	2.61	2.52	2.53	2.46	2.43	2.28
Nigeria	4.50	4.06	4.95	4.50	3.18	2.86	2.77	3.12	3.35	3.33	3.03
South Africa	2.03	2.15	2.46	2.74	3.09	3.24	3.45	3.87	4.17	4.26	4.22
Other	2.75	2.81	3.10	3.33	3.30	3.60	3.92	4.30	4.69	4.60	5.01
Total	16.44	16.70	18.30	17.35	15.09	15.42	16.12	17.53	18.44	18.18	18.29
Far East and Oceania											
Australia	3.43	3.51	3.66	3.53	3.89	4.04	4.24	4.42	5.34	5.49	5.99
China	16.16	18.05	18.53	18.32	18.10	19.13	20.46	22.39	24.14	24.90	26.08
India	2.95	3.14	3.30	3.35	4.09	4.43	4.87	5.21	5.52	5.96	5.77
Indonesia	3.85	3.71	3.83	4.16	4.27	3.65	3.84	4.27	4.24	4.33	4.28
Japan	1.65	1.91	2.00	2.30	2.27	2.45	2.52	2.56	2.96	3.05	3.21
Other	4.05	4.21	4.67	4.87	4.85	5.20	5.61	6.25	6.79	7.37	7.62
Total	32.09	34.53	35.99	36.53	37.47	38.90	41.54	45.10	48.99	51.10	52.95
World Total	268.37	273.87	288.31	286.50	281.66	279.98	282.07	296.79	304.12	314.05	321.33

[1] See Appendix E, Note 19.

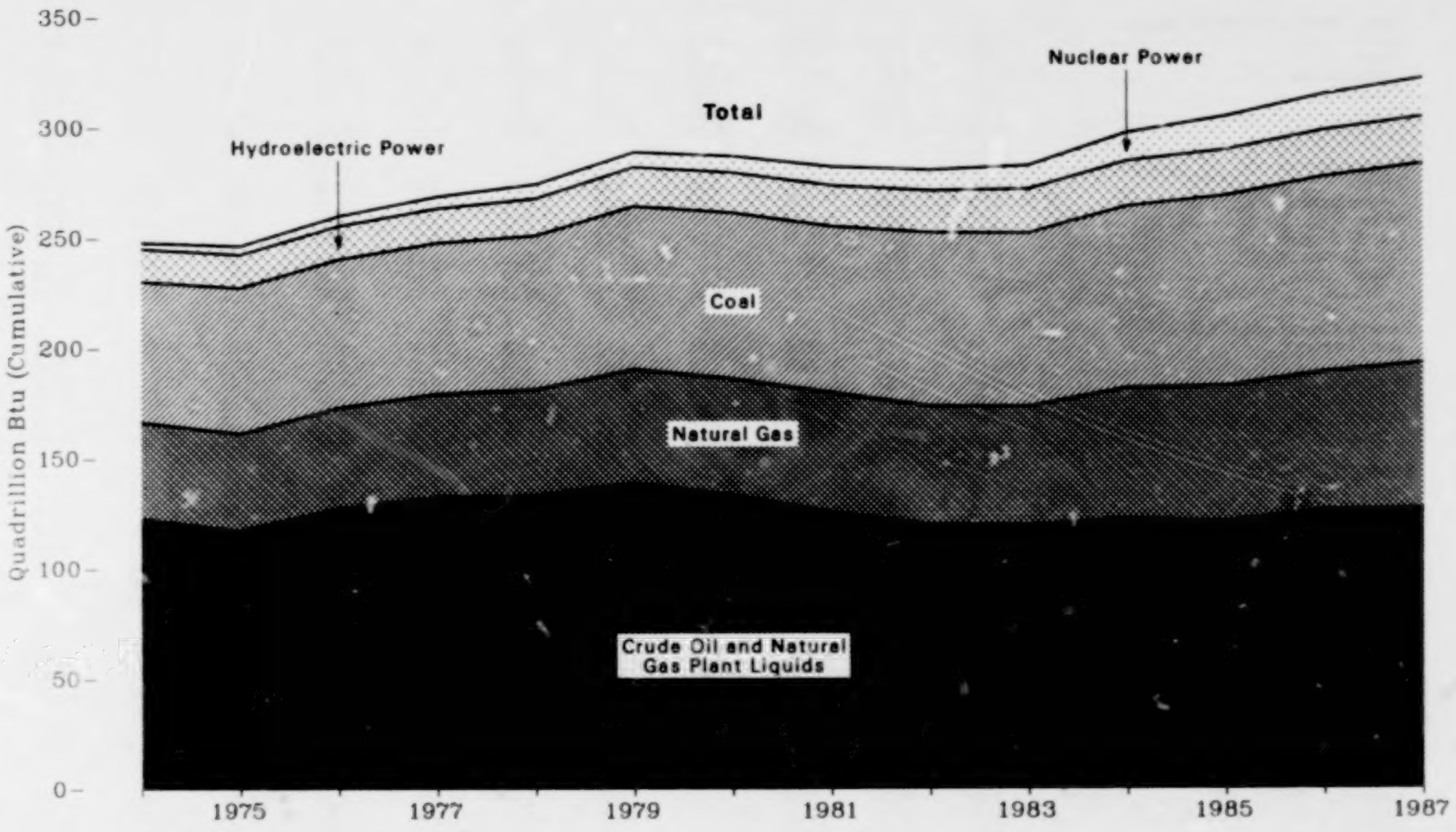
[a] Preliminary.

Note: Sum of components may not equal total due to independent rounding.

Note: Primary energy includes crude oil, lease condensate, natural gas plant liquids, dry natural gas, coal, net hydroelectric power, and net nuclear power. It excludes wood, waste, geothermal, wind, photovoltaic, and solar thermal energy.

Source: Energy Information Administration, *International Energy Annual 1987* (October 1988).

Figure 104. World Primary Energy Production by Source, 1974–1987



Source: See Table 104.

Table 104. World Primary Energy Production[1] by Source, 1974-1987

(Quadrillion Btu)

Year	Crude Oil[2] and Natural Gas Plant Liquids	Natural Gas[3]	Coal	Hydroelectric Power[4]	Nuclear Power[4]	Total[5]
1974	122.46	43.76	63.82	14.83	2.87	247.74
1975	117.22	43.90	66.17	15.03	3.85	246.18
1976	127.08	45.68	67.32	15.08	4.52	259.67
1977	132.08	46.88	68.46	15.56	5.40	268.37
1978	132.89	48.24	69.53	16.80	6.41	273.87
1979	138.57	51.57	73.81	17.69	6.67	288.31
1980	133.07	52.75	75.02	18.19	7.45	286.50
1981	125.34	54.16	75.21	18.48	8.48	281.66
1982	119.67	53.66	78.44	18.94	9.28	279.98
1983	119.14	53.97	78.45	19.92	10.60	282.07
1984	122.39	59.03	82.16	20.47	12.76	296.79
1985	120.91	61.28	86.09	20.75	15.09	304.12
1986	126.05	62.49	88.27	21.02	16.22	314.05
1987	126.61	65.92	90.21	21.15	17.45	321.33

[1] See Appendix E, Note 19.

[2] Includes lease condensate.

[3] Dry production.

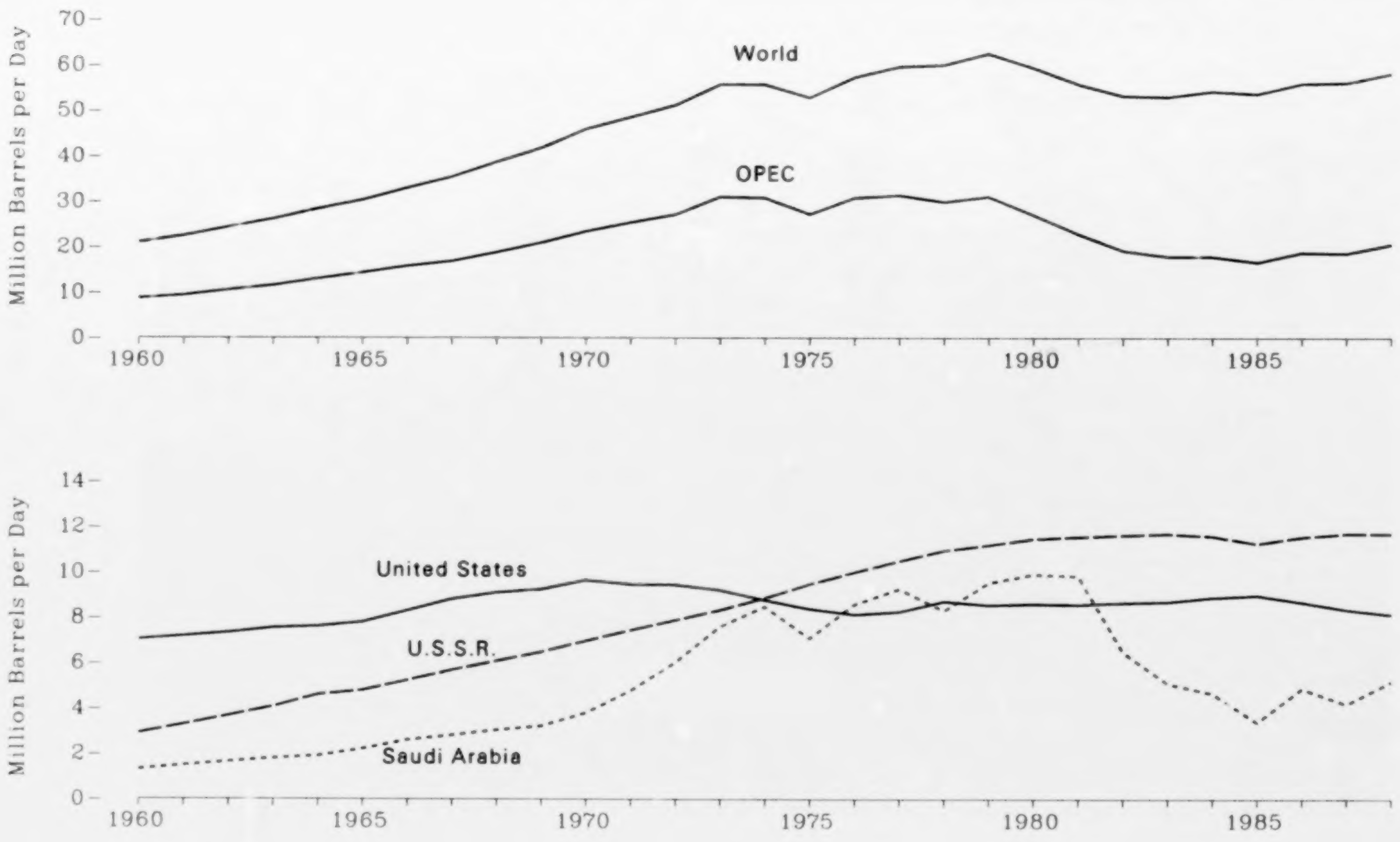
[4] Net generation, i.e., gross generation less plant use.

[5] Total excludes wood, waste, geothermal, wind, photovoltaic, and solar thermal energy.

Note: Sum of components may not equal total due to independent rounding.

Source: Energy Information Administration, *International Energy Annual 1987* (October 1988).

Figure 105. World Crude Oil Production, 1960–1988



Source: See Table 105.

Table 105. World Crude Oil[1] Production, 1960-1988

(Million Barrels per Day)

	Organization of Petroleum Exporting Countries (OPEC)[2]																
Year	Indonesia	Iran	Iraq	Nigeria	Saudi Arabia[3]	Venezuela	Other OPEC	Total OPEC	Canada	China	Mexico	United Kingdom	United States	U.S.S.R.	Other Non-OPEC	Total World	Market Economies
1960	0.41	1.07	0.97	0.02	1.31	2.85	2.07	8.70	0.52	0.10	0.27	(4)	7.04	2.91	1.42	20.96	17.65
1961	0.42	1.20	1.01	0.05	1.48	2.92	2.28	9.36	0.61	0.11	0.29	(4)	7.18	3.28	1.60	22.43	18.66
1962	0.45	1.34	1.01	0.07	1.64	3.20	2.80	10.51	0.67	0.12	0.31	(4)	7.33	3.67	1.71	24.32	20.14
1963	0.44	1.49	1.16	0.08	1.79	3.25	3.30	11.51	0.71	0.13	0.32	(4)	7.54	4.07	1.85	26.13	21.52
1964	0.46	1.71	1.26	0.12	1.90	3.39	4.14	12.98	0.75	0.18	0.32	(4)	7.61	4.60	1.92	28.36	23.15
1965	0.48	1.91	1.31	0.27	2.21	3.47	4.69	14.34	0.81	0.23	0.32	(4)	7.80	4.79	2.01	30.30	24.85
1966	0.47	2.13	1.39	0.42	2.60	3.37	5.39	15.77	0.88	0.29	0.33	(4)	8.30	5.23	2.13	32.93	26.96
1967	0.51	2.60	1.23	0.32	2.81	3.54	5.84	16.85	0.96	0.28	0.37	(4)	8.81	5.68	2.42	35.37	28.95
1968	0.60	2.84	1.50	0.14	3.04	3.61	7.06	18.79	1.19	0.30	0.39	(4)	9.10	6.08	2.79	38.64	31.85
1969	0.75	3.38	1.52	0.54	3.22	3.59	7.91	20.91	1.13	0.48	0.46	(4)	9.24	6.48	2.99	41.69	34.42
1970	0.85	3.83	1.55	1.08	3.80	3.71	8.59	23.41	1.26	0.60	0.49	(4)	9.64	6.97	3.50	45.87	37.87
1971	0.89	4.54	1.69	1.53	4.77	3.55	8.36	25.33	1.35	0.78	0.49	(4)	9.46	7.44	3.64	48.48	39.83
1972	1.08	5.02	1.47	1.82	6.02	3.22	8.46	27.09	1.53	0.90	0.51	(4)	9.44	7.88	3.77	51.13	41.91
1973	1.34	5.86	2.02	2.05	7.60	3.37	8.75	30.99	1.80	1.09	0.47	(4)	9.21	8.33	3.80	55.68	45.81
1974	1.38	6.02	1.97	2.26	8.48	2.98	7.64	30.73	1.55	1.32	0.57	(4)	8.77	8.86	3.86	55.66	45.02
1975	1.31	5.35	2.26	1.78	7.08	2.35	7.03	27.15	1.43	1.49	0.71	0.01	8.38	9.47	4.14	52.78	41.34
1976	1.50	5.88	2.42	2.07	8.58	2.29	8.00	30.74	1.31	1.67	0.83	0.25	8.13	9.99	4.36	57.27	45.13
1977	1.69	5.66	2.35	2.09	9.25	2.24	8.02	31.30	1.32	1.87	0.98	0.77	8.25	10.49	4.62	59.59	46.75
1978	1.64	5.24	2.56	1.90	8.30	2.17	8.07	29.88	1.32	2.08	1.21	1.08	8.71	10.95	4.78	60.00	46.50
1979	1.59	3.17	3.48	2.30	9.53	2.36	8.57	31.00	1.50	2.12	1.46	1.57	8.55	11.19	5.09	62.48	48.72
1980	1.58	1.66	2.51	2.06	9.90	2.17	7.11	26.99	1.44	2.11	1.94	1.62	8.60	11.46	5.20	59.35	45.36
1981	1.61	1.38	1.00	1.43	9.82	2.10	5.50	22.84	1.29	2.01	2.31	1.81	8.57	11.55	5.39	55.78	41.78
1982	1.34	2.21	1.01	1.30	6.48	1.90	4.91	19.15	1.27	2.05	2.75	2.07	8.65	11.62	5.65	53.18	39.07
1983	1.34	2.44	1.01	1.24	5.09	1.80	4.97	17.89	1.36	2.12	2.69	2.29	8.69	11.68	6.25	52.97	38.70
1984	1.41	2.17	1.21	1.39	4.66	1.80	5.22	17.86	1.44	2.30	2.78	2.48	8.88	11.58	6.90	54.20	39.89
1985	1.33	2.25	1.43	1.50	3.39	1.68	5.05	16.63	1.47	2.51	2.75	2.53	8.97	11.25	7.54	53.65	39.46
1986	1.39	2.04	1.69	1.48	4.87	1.79	5.49	18.75	1.47	2.62	2.44	2.54	8.68	11.54	7.85	55.89	41.30
1987	1.31	2.43	2.08	1.34	4.19	1.75	5.48	18.58	1.53	2.69	2.54	2.48	8.35	11.69	8.23	56.10	41.28
1988[5]	1.28	2.26	2.65	1.44	5.18	1.85	5.87	20.52	1.60	2.69	2.51	2.27	8.13	11.68	8.69	58.09	43.31

[1] Includes lease condensate, excludes natural gas plant liquids.

[2] See Glossary for membership.

[3] Includes about one-half of the production in the Neutral Zone between Kuwait and Saudi Arabia.

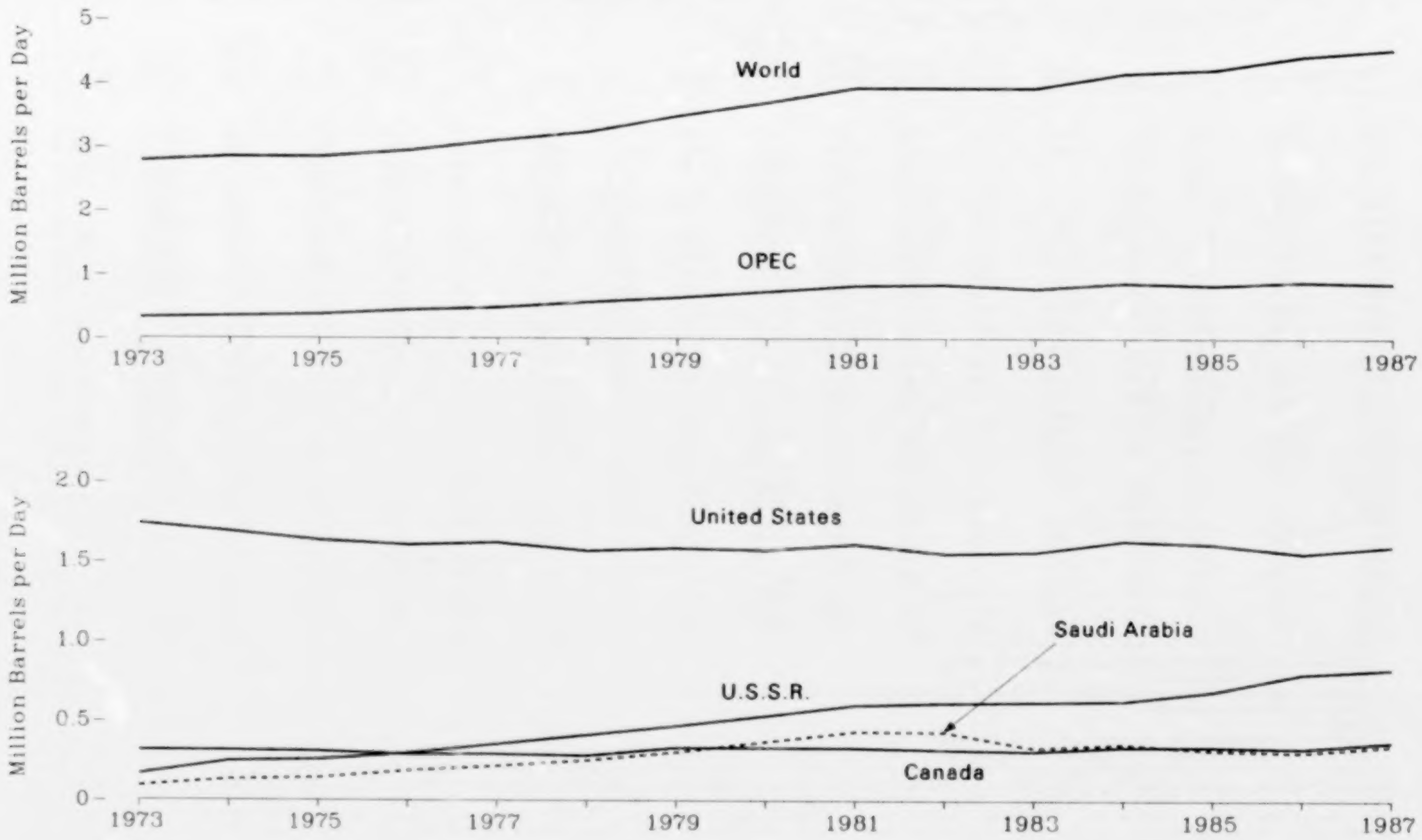
[4] Less than 5,000 barrels per day.

[5] Preliminary.

Note: Sum of components may not equal total due to independent rounding.

Sources: **China** •1960 through 1972—Central Intelligence Agency, unpublished data. •1973 through 1987—Energy Information Administration, *International Energy Annual*. •1988—Energy Information Administration, *Monthly Energy Review*. **United States** •1960 through 1975—Bureau of Mines, Mineral Industry Surveys, *Petroleum Statement, Annual*. •1976 through 1980—Energy Information Administration, Energy Data Reports, *Petroleum Statement, Annual*. •1981 through 1987—Energy Information Administration, *Petroleum Supply Annual*. •1988—Energy Information Administration, *Monthly Energy Review*. **U.S.S.R.:** •1960 through 1972—USSR Central Statistical Office, *Narodnoye Khozyaystvo SSSR* (National Economy USSR). •1973 through 1987—Energy Information Administration, *International Energy Annual*. •1988—Energy Information Administration, *Monthly Energy Review*. **OPEC Nations:** •1960 through 1972—Organization of Petroleum Exporting Countries, *Annual Statistical Bulletin 1979*. •1973 through 1987—Energy Information Administration, *International Energy Annual*. •1988—Energy Information Administration, *Monthly Energy Review*. **All other countries:** •1960 through 1969—Bureau of Mines, *International Petroleum Annual, 1969*. •1970 through 1972—Energy Information Administration, *International Petroleum Annual, 1978*. •1973 through 1987—Energy Information Administration, *International Energy Annual*. •1988—Energy Information Administration, *Monthly Energy Review* December 1988 (March 1989).

Figure 106. World Natural Gas Plant Liquids Production, 1973–1987



Source: See Table 106.

Table 106. World Natural Gas Plant Liquids Production, 1973-1987

(Thousand Barrels per Day)

	Organization of Petroleum Exporting Countries (OPEC)[1]															
Year	Algeria	Kuwait[2]	Saudi Arabia[2]	United Arab Emirates	Venezuela	Other OPEC	Total OPEC	Australia	Canada	Mexico	United Kingdom	United States	U.S.S.R.	Other Non-OPEC	Total World	Market Economies
1973	9	60	90	([3])	89	77	325	50	314	75	5	1,738	165	109	2,781	2,599
1974	12	50	130	([3])	84	71	347	50	314	80	5	1,688	246	116	2,846	2,582
1975	20	50	140	([3])	76	87	373	50	309	80	15	1,633	256	126	2,842	2,567
1976	24	50	185	([3])	77	106	442	50	289	95	15	1,603	295	153	2,942	2,625
1977	19	55	215	15	78	100	482	55	290	105	30	1,618	353	139	3,102	2,725
1978	25	75	250	30	61	127	568	60	281	115	40	1,567	410	194	3,235	2,796
1979	30	95	303	30	69	112	639	60	331	150	45	1,584	467	208	3,484	2,985
1980	36	95	369	35	60	139	734	60	331	193	45	1,573	531	228	3,695	3,126
1981	49	60	433	60	55	170	827	60	330	241	50	1,609	598	212	3,927	3,291
1982	58	40	430	90	60	166	844	52	318	255	78	1,550	612	217	3,926	3,276
1983	56	55	330	120	57	164	782	52	309	265	111	1,559	618	232	3,928	3,268
1984	105	67	355	130	57	157	871	54	336	257	136	1,630	625	249	4,158	3,489
1985	120	54	316	160	63	122	835	65	337	271	145	1,609	685	271	4,218	3,486
1986	120	75	304	185	97	109	890	60	328	352	152	1,551	795	301	4,429	3,587
1987[4]	90	70	345	145	95	117	862	65	367	340	162	1,595	825	319	4,535	3,661

[1] See Glossary for membership.

[2] Includes about one-half of the production in the Neutral Zone between Kuwait and Saudi Arabia.

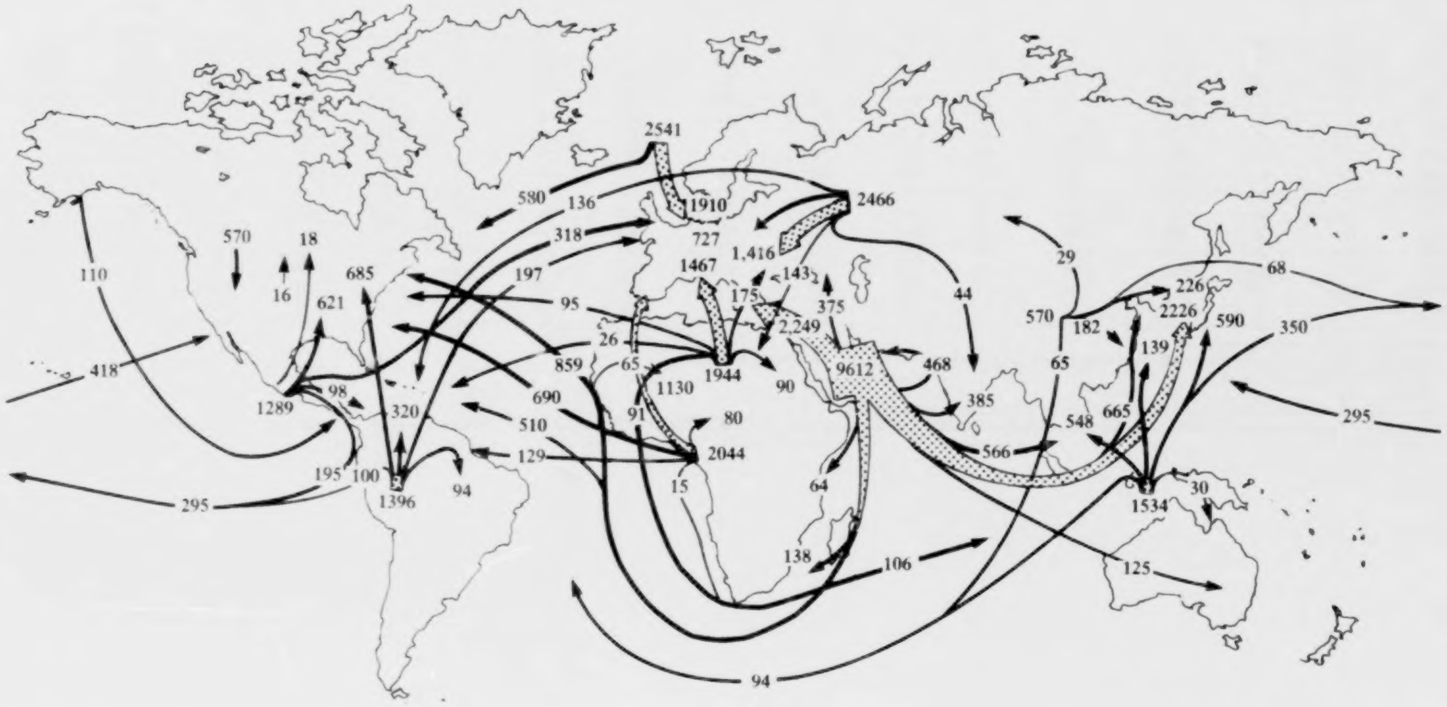
[3] Less than 500 barrels per day.

[4] Preliminary.

Note: Sum of components may not equal total due to independent rounding.

Sources: •1973 through 1983—Energy Information Administration, *International Energy Annual 1983*. •1984 and forward—Energy Information Administration, *International Energy Annual 1987* (October 1988).

Figure 107. International Crude Oil Flow, 1986
(Thousand Barrels Per Day)


2541
580
136
1910
2466
318
727
1,416
197
1467
143
570
18
16
685
621
110
95
175
375
2,249
44
29
26
859
65
1944
90
9612
468
418
1289
98
320
690
510
1130
91
80
2044
129
195
100
1396
94
15
64
295
385
566
138
106
94
570
65
182
226
2226
68
590
350
139
665
548
295
1534
30
125

Note: Arrows indicate origins and destinations but not necessarily specific routes. Several minor routes and quantities are not displayed.
Source: See Table 107.

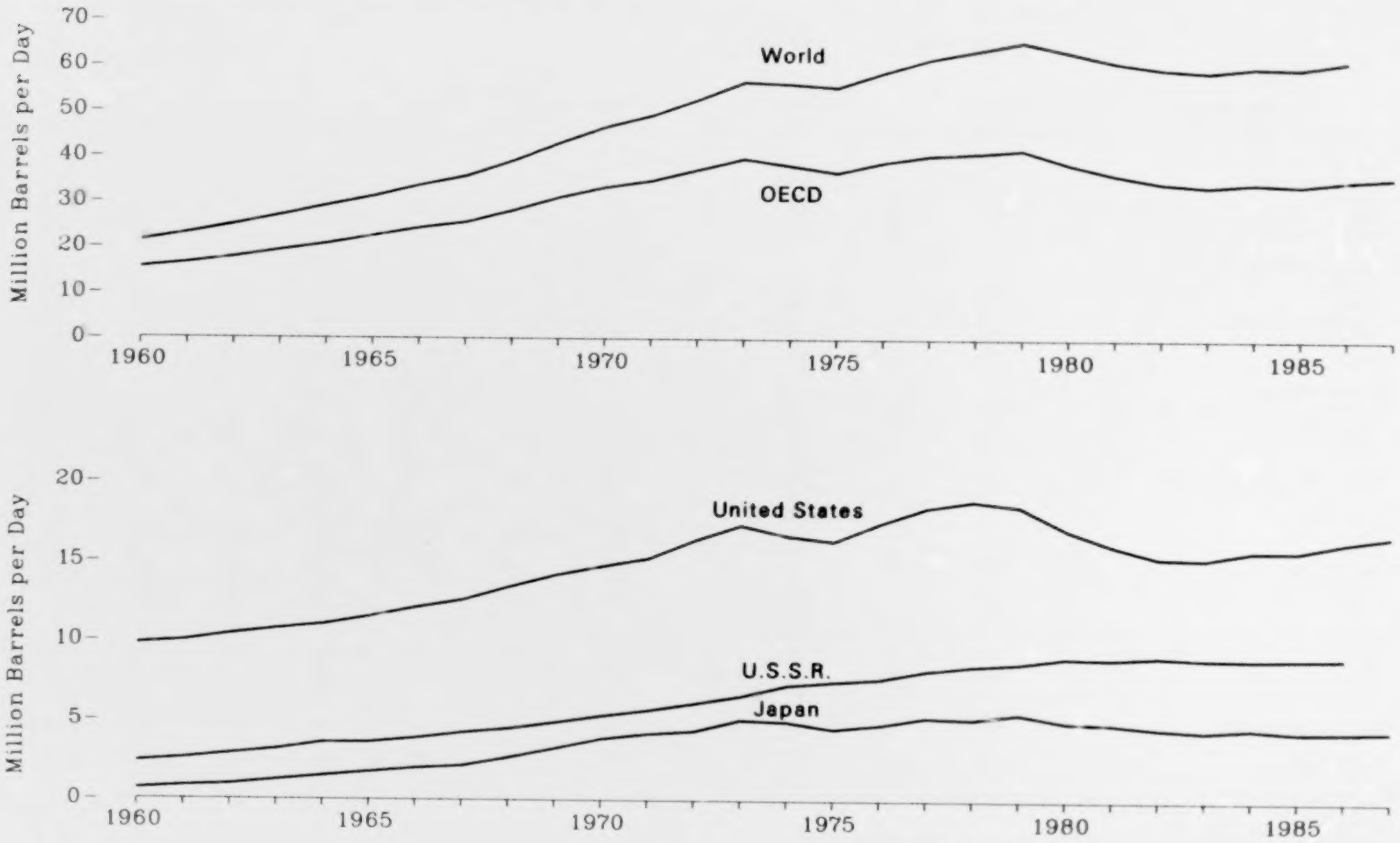
Table 107. International Crude Oil Flow, 1986

(Thousand Barrels per Day)

Exporting Area and Country	Importing Area or Country									
	North America		Central and South America						Far East and Oceania		
	United States	Canada	Caribbean Area	Other	Western Europe	Eastern Europe and U.S.S.R.	Middle East	Africa	Japan	Other	Total[1]
North America											
Canada	570	—	—	—	—	—	—	—	1	2	573
Mexico	621	18	58	40	318	—	39	—	183	12	1,289
United States	—	16	[2] 110	—	—	—	—	—	—	28	154
Central and South America											
Ecuador	64	—	41	22	—	—	—	—	1	68	196
Peru	9	—	—	2	—	—	—	—	—	2	13
Trinidad and Tobago	93	—	—	—	—	—	—	—	—	—	93
Venezuela	416	40	213	64	192	—	—	18	6	—	949
Other	63	—	66	6	5	—	—	—	2	3	145
Western Europe											
Norway	53	21	—	—	647	—	18	—	—	—	739
United Kingdom	317	151	22	—	1,204	—	—	1	10	—	1,705
Other	9	7	—	—	59	12	—	9	1	—	97
Eastern Europe and U.S.S.R.	(3)	—	120	16	727	1,416	11	132	2	42	2,466
Middle East											
Iran	19	30	71	19	527	58	100	35	220	306	1,385
Iraq	81	—	—	196	746	31	54	23	164	74	1,369
Saudi Arabia	618	25	2	209	1,462	65	232	92	509	486	3,700
United Arab Emirates	38	—	3	5	131	—	—	46	697	260	1,180
Other[4]	48	—	1	4	300	221	82	71	636	615	1,978
Africa											
North[5]	91	4	6	20	1,467	175	76	14	18	73	1,944
West[6]	503	40	30	66	921	—	—	57	2	13	1,632
Other	147	—	20	13	209	—	—	23	—	—	412
Far East and Oceania[7]	418	—	41	53	28	1	—	17	816	730	2,104
World Total	4,178	352	804	735	8,943	1,979	612	538	3,268	2,714	24,123

[1] The data in this column are total imports; they do not equal reported exports because of changes in stocks at sea, exchanges, transshipments, and other statistical discrepancies.
[2] Includes shipments to Puerto Rico and the Virgin Islands.
[3] Less than 500 barrels per day.
[4] Primarily tanker shipments to countries bordering the Indian or Pacific Oceans.
[5] Includes Algeria, Egypt, Libya, Morocco, and Tunisia.
[6] Includes Benin, Cameroon, Equatorial Guinea, Gabon, Ghana, Ivory Coast, Nigeria, and Togo.
[7] Primarily Indonesia, China, Malaysia, and Brunei.
— = Not applicable.
Note: Transshipments are assigned to the country of original lading, if known.
Note: Sum of components may not equal total due to independent rounding.
Source: Energy Information Administration. *International Energy Annual 1987* (October 1988).

Figure 108. World Petroleum Consumption, 1960-1987



Source: See Table 108.

Table 108. World Petroleum Consumption, 1960-1987

(Million Barrels per Day)

Year	Organization for Economic Cooperation and Development (OECD)[1]																
	Australia	Canada	France	West Germany	Italy	Japan	Spain	United Kingdom	United States	Other OECD	Total	Brazil	China	Mexico	U.S.S.R.	Total World	Market Economies
1960	0.22	0.84	0.56	0.63	0.44	0.66	0.10	0.94	9.80	1.28	15.47	0.27	0.17	0.30	2.38	21.34	18.32
1961	0.23	0.87	0.63	0.79	0.54	0.82	0.12	1.04	9.98	1.45	16.46	0.28	0.17	0.29	2.57	23.00	19.57
1962	0.25	0.92	0.73	1.00	0.67	0.93	0.12	1.12	10.40	1.62	17.74	0.31	0.14	0.30	2.87	24.89	21.20
1963	0.29	0.99	0.86	1.17	0.77	1.21	0.12	1.27	10.74	1.85	19.26	0.34	0.17	0.31	3.15	26.92	22.90
1964	0.32	1.05	0.98	1.36	0.90	1.48	0.20	1.36	11.02	2.03	20.70	0.35	0.20	0.33	3.58	29.08	24.76
1965	0.35	1.14	1.09	1.61	0.98	1.74	0.23	1.49	11.51	2.30	22.44	0.33	0.23	0.34	3.61	31.14	26.45
1966	0.37	1.21	1.19	1.80	1.08	1.98	0.31	1.58	12.08	2.61	24.20	0.38	0.30	0.36	3.87	33.56	28.53
1967	0.41	1.25	1.34	1.86	1.19	2.14	0.36	1.64	12.56	2.72	25.48	0.38	0.28	0.39	4.22	35.59	30.08
1968	0.45	1.34	1.46	1.99	1.40	2.66	0.46	1.82	13.39	3.08	28.05	0.46	0.31	0.41	4.48	38.96	32.96
1969	0.49	1.42	1.66	2.33	1.69	3.25	0.49	1.98	14.14	3.49	30.94	0.48	0.44	0.45	4.87	42.89	36.37
1970	0.51	1.49	1.89	2.43	1.84	3.85	0.56	2.09	14.70	3.87	33.22	0.51	0.62	0.50	5.30	46.47	39.17
1971	0.54	1.53	2.05	2.61	1.93	4.18	0.60	2.09	15.21	3.95	34.71	0.56	0.79	0.52	5.65	49.02	41.06
1972	0.54	1.62	2.24	2.76	2.07	4.36	0.67	2.24	16.37	4.32	37.18	0.65	0.91	0.56	6.10	52.58	43.96
1973	0.59	1.71	2.42	2.92	2.15	5.07	0.74	2.30	17.31	4.41	39.61	0.77	1.12	0.61	6.57	56.47	47.00
1974	0.62	1.74	2.26	2.61	2.09	4.96	0.78	2.14	16.65	4.27	38.12	0.83	1.19	0.67	7.25	56.03	45.77
1975	0.60	1.72	2.14	2.52	1.94	4.50	0.84	1.87	16.32	4.16	36.60	0.87	1.36	0.74	7.47	55.35	44.56
1976	0.62	1.75	2.28	2.71	1.99	4.77	0.98	1.86	17.46	4.45	38.86	0.97	1.46	0.80	7.65	58.65	47.45
1977	0.66	1.78	2.24	2.84	1.91	5.23	0.93	1.88	18.43	4.47	40.36	1.01	1.64	0.84	8.18	61.56	49.48
1978	0.61	1.82	2.17	3.05	1.95	5.14	0.95	1.85	18.85	4.51	40.89	1.06	1.79	0.99	8.47	63.46	50.69
1979	0.61	1.89	2.39	3.07	2.01	5.48	0.98	1.93	18.51	4.76	41.65	1.18	1.80	1.10	8.64	65.38	52.25
1980	0.59	1.87	2.26	2.71	1.93	4.96	0.99	1.73	17.06	4.50	38.60	1.16	1.77	1.27	9.00	63.20	49.72
1981	0.58	1.77	2.02	2.45	1.87	4.85	0.94	1.59	16.06	4.14	36.27	1.10	1.71	1.40	8.94	61.00	47.79
1982	0.62	1.58	1.88	2.37	1.78	4.58	1.00	1.59	15.30	3.82	34.52	1.08	1.66	1.48	9.08	59.62	46.34
1983	0.59	1.45	1.84	2.32	1.75	4.40	1.01	1.53	15.23	3.67	33.79	1.01	1.73	1.43	8.95	58.95	45.78
1984	0.61	1.47	1.75	2.32	1.65	4.58	0.91	1.85	15.73	3.63	34.50	1.07	1.74	1.48	8.91	60.00	46.78
1985	0.61	1.49	1.73	2.35	1.69	4.37	0.84	1.63	15.73	3.66	34.10	1.13	1.78	1.53	8.95	59.82	46.55
1986	0.61	1.51	1.77	2.50	1.70	4.39	0.84	1.64	16.28	3.89	35.13	1.30	1.92	1.47	8.98	61.36	47.96
1987	0.63	1.56	1.79	2.42	1.82	4.45	0.87	1.60	16.67	3.97	35.78	NA	NA	NA	NA	NA	NA

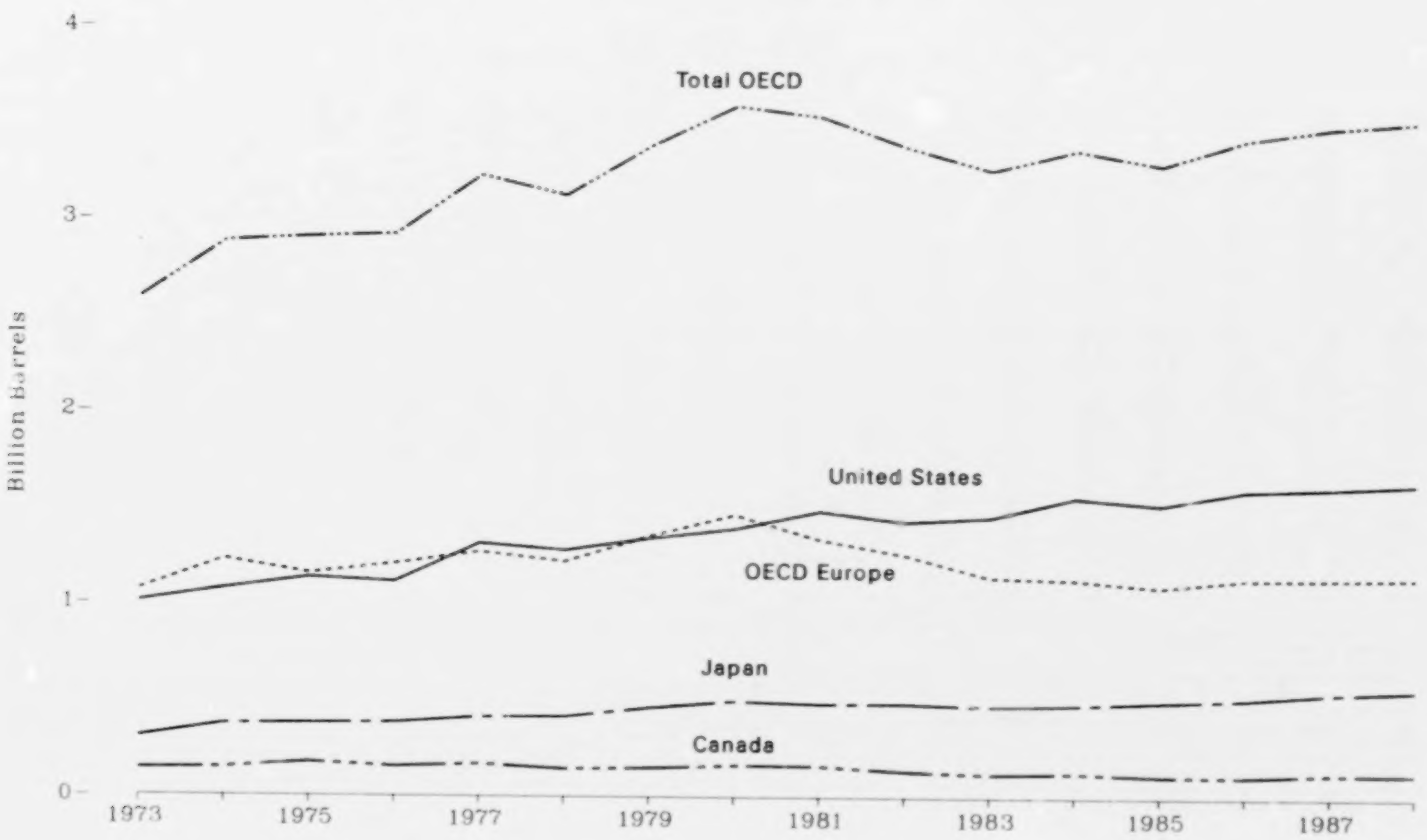
[1] See Glossary for membership. "Other OECD" includes the United States territories of Puerto Rico, Virgin Islands, Guam, and Hawaiian Trade Zone. As of January 1, 1987, Hawaiian Trade Zone data are included in U.S. 50 States data.

NA = Not available.

Note: Sum of components may not equal total due to independent rounding.

Sources: **United States:** •1960 through 1976—Bureau of Mines, Mineral Industry Surveys, *Petroleum Statement, Annual.* •1977 through 1980—Energy Information Administration, Energy Data Reports, *Petroleum Statement, Annual.* •1981 and forward—Energy Information Administration, *Petroleum Supply Annual.* **U.S.S.R.:** •1960 through 1976—U.S.S.R. Central Statistical Office, *Narodnoye Khozyaystvo SSSR* (National Economy U.S.S.R.), and *Vneshnyaya Torgoliya SSSR* (Foreign Trade of the U.S.S.R.), annual issues. •1977 through 1979—U.S.S.R. Central Statistical Office, *Narodnoye Khozyaystvo SSSR* (National Economy U.S.S.R.), annual issues; U.S.S.R. trade as imports reported by their trading partners in official trade statistics of the respective countries. •1980 and forward—Energy Information Administration, *International Energy Annual 1987.* **China:** •1960 through 1979—Central Intelligence Agency, unpublished data. •1980 and forward—Energy Information Administration, *International Energy Annual 1987.* **All other countries:** •1960 through 1969—Bureau of Mines, *International Petroleum Annual, 1969.* •1970 through 1978—Energy Information Administration, *International Petroleum Annual 1978.* •1979 through 1986—Energy Information Administration, *International Energy Annual 1987.* •1987—OECD, *Quarterly Oil Statistics.*

Figure 109. Petroleum Stocks in OECD Countries, End of Year 1973-1988



Source: See Table 109.

Table 109. Petroleum Stocks [1] in OECD Countries, [2] End of Year 1973-1988

(Million Barrels)

Year	France	West Germany	Italy	United Kingdom	Other OECD Europe	OECD Europe	Canada	Japan	United States	Other OECD [3]	OECD
1973	201	181	152	156	380	1,070	140	303	1,008	67	2,588
1974	249	213	167	161	437	1,227	145	370	1,074	64	2,880
1975	225	187	143	165	434	1,154	174	375	1,133	67	2,903
1976	234	208	143	165	455	1,205	153	380	1,112	68	2,918
1977	239	225	161	148	495	1,268	167	409	1,312	68	3,224
1978	201	238	154	157	469	1,219	144	413	1,278	68	3,122
1979	226	272	163	169	523	1,353	150	460	1,341	75	3,379
1980	243	319	170	168	564	1,464	164	495	1,392	72	3,587
1981	214	297	167	143	516	1,337	161	482	1,484	67	3,531
1982	193	272	179	125	489	1,258	136	484	1,430	68	3,376
1983	153	249	149	118	473	1,142	121	470	1,454	68	3,255
1984	152	239	159	112	468	1,130	128	479	1,556	69	3,362
1985	139	233	157	123	442	1,092	113	494	1,519	66	3,284
1986	127	252	155	124	475	1,133	111	509	1,593	72	3,418
1987	127	264	169	121	455	1,136	126	540	1,607	72	3,480
1988[4]	128	270	162	119	461	1,140	124	556	1,627	66	3,513

[1] Includes crude oil, lease condensate, natural gas plant liquids, unfinished oils, and finished petroleum products. See Appendix E, Note 20.

[2] Organization for Economic Cooperation and Development. See Glossary for membership.

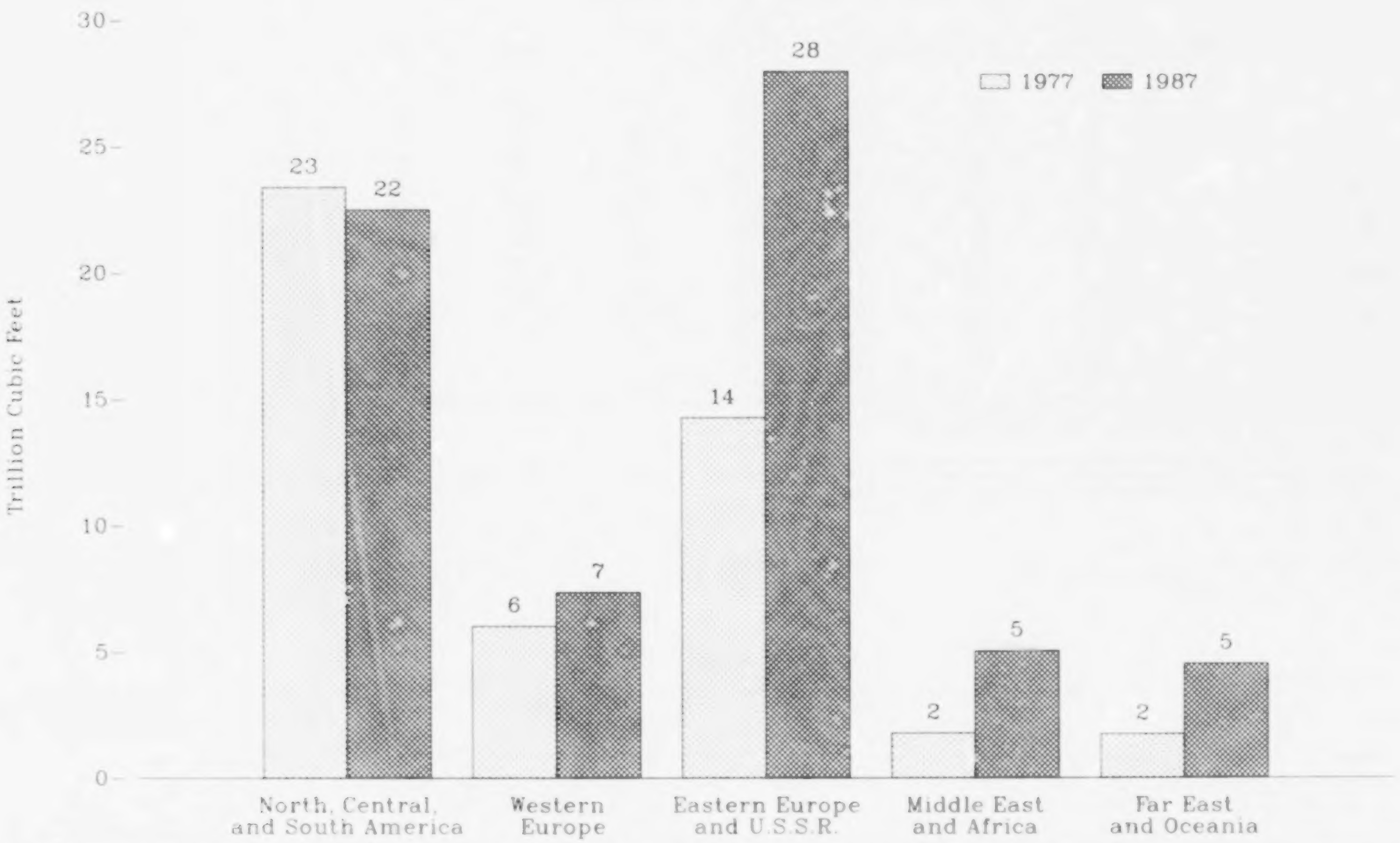
[3] Includes Australia, New Zealand, and United States Territories.

[4] As of September 30.

Note: Sum of components may not equal total due to independent rounding.

Sources: **United States:** Energy Information Administration, *Petroleum Supply Monthly November 1988* (January 1989). **Other Data:** Organization for Economic Cooperation and Development/International Energy Agency, *Quarterly Oil and Gas Statistics*.

Figure 110. World Dry Natural Gas Production, 1977 and 1987



Source: See Table 110.

Table 110. World Dry Natural Gas Production, 1977-1987

(Trillion Cubic Feet)

Area and Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987[1]
North, Central, and South America											
Argentina	0.28	0.28	0.26	0.28	0.35	0.40	0.44	0.49	0.50	0.55	0.54
Canada	2.59	2.47	2.66	2.65	2.47	2.45	2.52	2.61	2.98	2.77	2.90
Mexico	0.54	0.67	0.81	1.01	1.03	1.11	1.10	1.04	0.95	0.92	0.93
United States	19.16	19.12	19.66	19.40	19.18	17.76	16.03	17.39	16.38	15.99	16.54
Venezuela	0.39	0.40	0.46	0.49	0.52	0.60	0.58	0.61	0.62	0.67	0.70
Other	0.40	0.53	0.61	0.53	0.44	0.43	0.47	0.61	0.64	0.57	1.06
Total	23.36	23.48	24.46	24.36	23.99	22.75	21.14	22.75	22.07	21.47	22.47
Western Europe											
Italy	0.48	0.48	0.46	0.42	0.49	0.51	0.46	0.49	0.50	0.56	0.58
Netherlands	2.93	2.50	2.72	3.38	3.15	2.67	2.58	2.65	2.73	2.57	2.66
Norway	0.09	0.39	0.76	0.88	0.89	0.90	0.86	0.93	0.94	0.96	1.04
United Kingdom	1.38	1.30	1.31	1.23	1.22	1.36	1.40	1.42	1.52	1.60	1.68
West Germany	0.68	0.72	0.73	0.67	0.68	0.59	0.61	0.66	0.61	0.54	0.62
Other	0.45	0.38	0.41	0.44	0.40	0.41	0.43	0.44	0.46	0.44	0.76
Total	6.01	5.77	6.39	7.02	6.83	6.44	6.34	6.59	6.75	6.67	7.34
Eastern Europe and U.S.S.R.											
Romania	1.20	1.07	1.20	1.20	1.24	1.35	1.40	1.34	1.27	1.34	1.32
U.S.S.R.	12.22	13.14	14.36	15.37	16.43	17.68	18.93	20.74	22.71	24.19	25.67
Other	0.83	0.89	0.76	0.77	0.82	0.76	0.85	0.94	0.98	0.91	0.93
Total	14.25	15.10	16.32	17.34	18.49	19.79	21.18	23.02	24.96	26.44	27.92
Middle East and Africa											
Algeria	0.21	0.66	0.55	0.41	0.77	0.94	1.31	1.36	1.36	1.33	1.48
Iran	0.55	0.50	0.54	0.25	0.21	0.25	0.31	0.48	0.60	0.54	0.56
Saudi Arabia	0.28	0.33	0.41	0.37	0.69	0.20	0.19	0.62	0.72	0.89	0.94
United Arab Emirates	0.19	0.17	0.19	0.20	0.23	0.20	0.27	0.34	0.48	0.54	0.60
Other	0.54	0.64	0.85	0.79	0.84	0.88	0.87	1.00	1.08	1.21	1.44
Total	1.77	2.30	2.54	2.02	2.74	2.47	2.95	3.80	4.24	4.51	5.02
Far East and Oceania											
Australia	0.24	0.26	0.28	0.32	0.38	0.38	0.39	0.40	0.45	0.48	0.50
Brunei	0.29	0.30	0.29	0.32	0.34	0.32	0.33	0.30	0.29	0.29	0.30
China	0.41	0.50	0.51	0.50	0.45	0.38	0.43	0.44	0.46	0.48	0.49
Indonesia	0.20	0.20	0.39	0.63	0.66	0.67	0.78	1.06	1.23	1.18	1.29
Malaysia	0.03	0.04	0.01	0.04	0.04	0.06	0.15	0.32	0.44	0.53	0.53
Pakistan	0.18	0.19	0.23	0.29	0.32	0.35	0.34	0.35	0.36	0.39	0.41
Other	0.38	0.35	0.30	0.28	0.38	0.51	0.54	0.63	0.75	0.81	0.99
Total	1.73	1.84	2.01	2.38	2.57	2.67	2.96	3.50	3.98	4.16	4.51
World Total	47.14	48.50	51.73	53.11	54.62	54.12	54.57	59.66	62.00	63.25	67.28

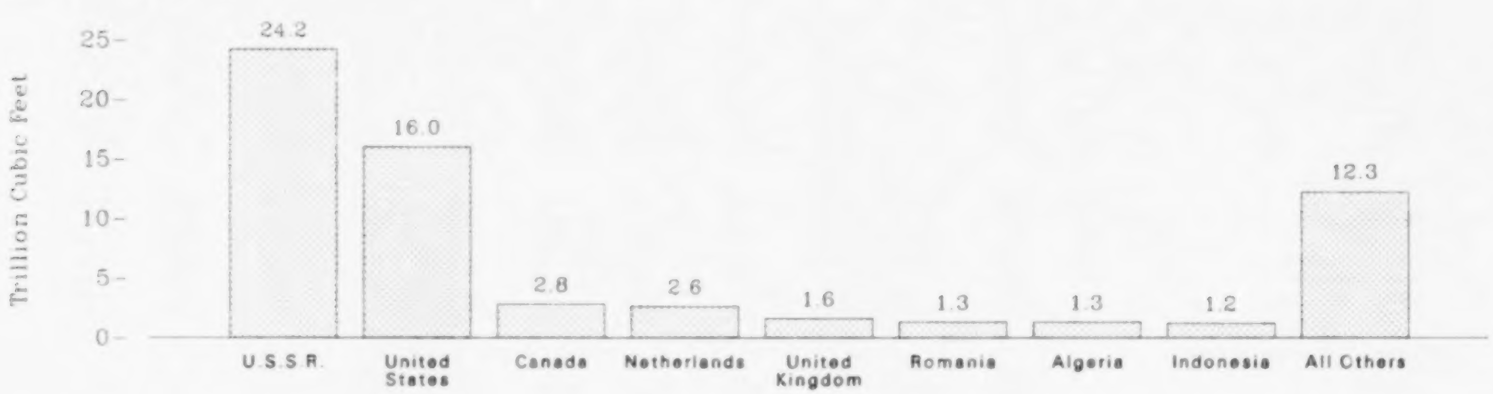
[1] Preliminary.

Note: Sum of components may not equal total due to independent rounding.

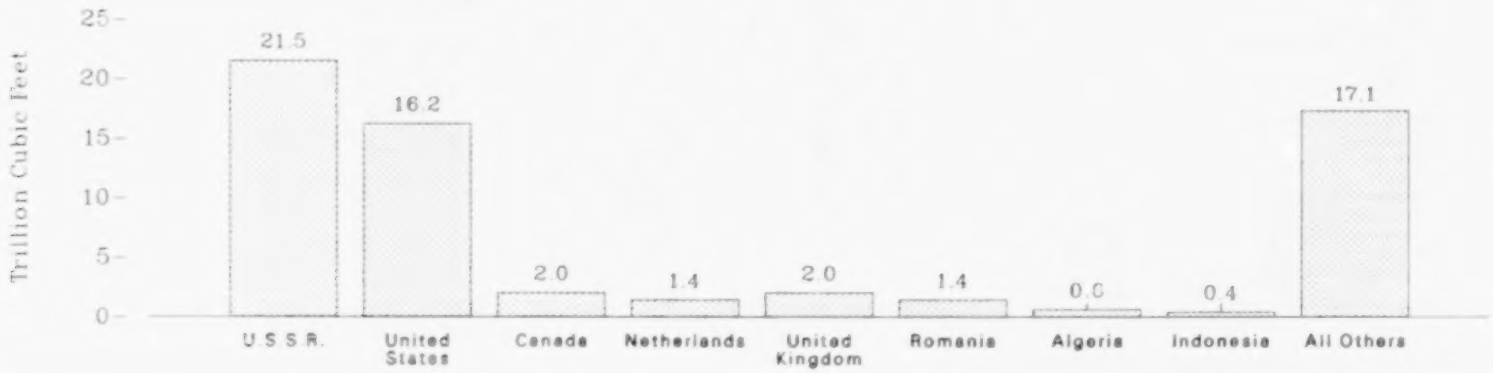
Sources: **United States:** •1987—Energy Information Administration, *Natural Gas Annual 1987* (October 1988). **All Other Data:** Energy Information Administration, *International Energy Annual 1987* (October 1988).

Figure 111. World Natural Gas Production and Consumption, 1986

Production In Selected Countries



Consumption In Selected Countries



Source: See Table

Table 111. World Natural Gas Supply and Disposition, 1986

(Billion Cubic Feet)

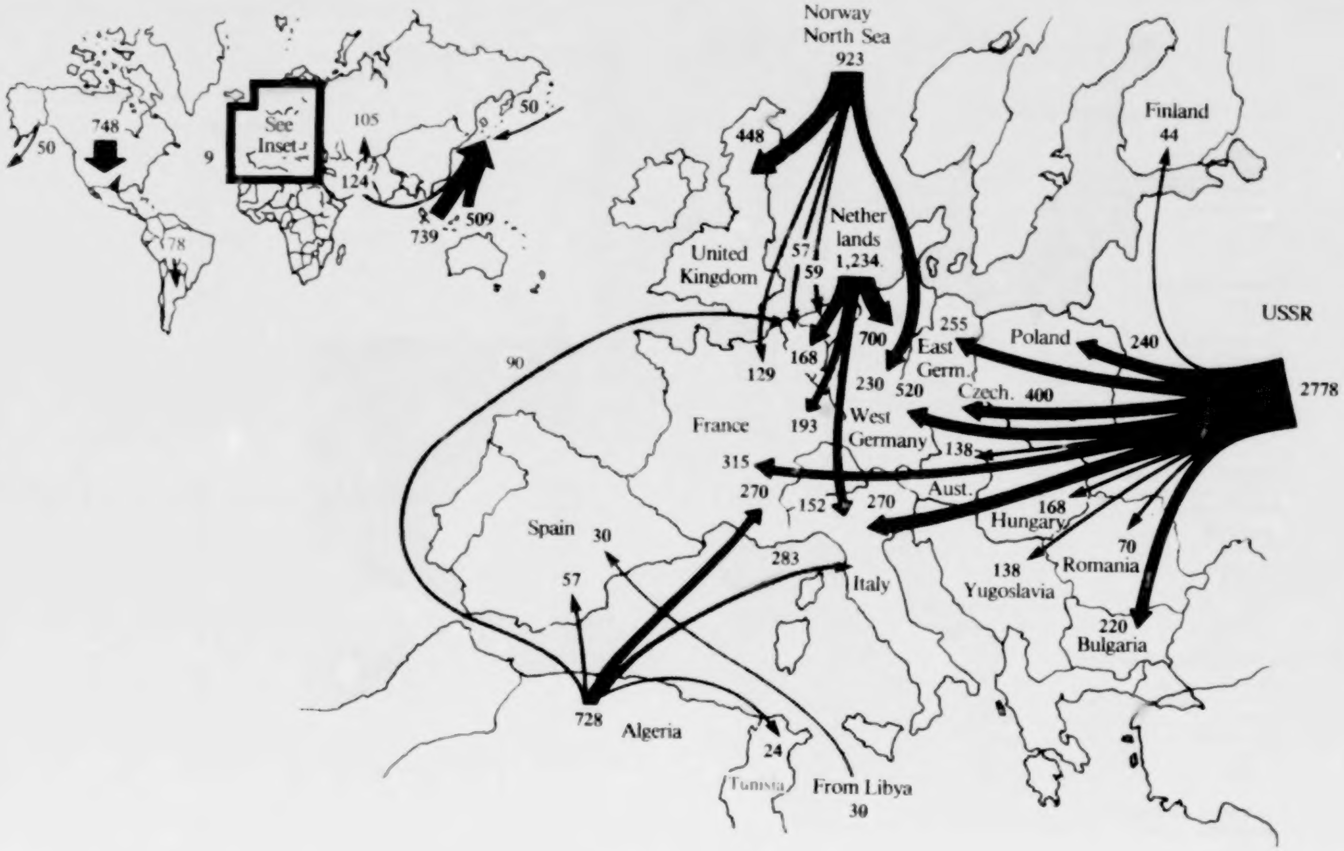
Area and Country	Supply		Disposition	
	Dry Natural Gas Production	Imports	Exports	Apparent Consumption
North, Central, and South America				
Argentina	547	78	0	625
Canada	2,774	9	748	2,035
Mexico	921	2	0	923
United States	15,991	749	61	[1] 16,221
Venezuela	674	0	0	674
Other	558	0	78	480
Total	21,465	838	887	20,958
Western Europe				
France	147	907	0	1,054
Italy	562	705	0	1,267
Netherlands	2,570	59	1,234	1,395
Norway	957	0	923	34
United Kingdom	1,600	448	0	2,048
West Germany	545	1,467	39	1,973
Other	289	790	21	1,058
Total	6,670	4,376	2,217	8,829
Eastern Europe and U.S.S.R.				
Czechoslovakia	25	402	0	427
East Germany	403	255	2	656
Hungary	250	168	0	418
Poland	205	240	0	445
Romania	1,340	70	0	1,410
U.S.S.R.	24,195	105	2,778	21,522
Other	19	220	0	239
Total	26,437	1,460	2,780	25,117
Middle East and Africa				
Algeria	1,330	0	728	602
Iran	536	0	0	536
Kuwait	173	18	0	191
Saudi Arabia	890	0	0	890
Other	1,582	24	154	1,452
Total	4,511	42	882	3,672
Far East and Oceania				
Australia	483	0	0	483
Brunei	293	0	260	33
China	484	0	0	484
Indonesia	1,180	0	739	441
Japan	75	1,397	0	1,472
Pakistan	392	0	0	392
Other	1,258	5	354	909
Total	4,165	1,402	1,353	4,214
World Total	63,249	8,118	8,118	62,790

[1] Actual consumption.

Note: Sum of components may not equal total due to independent rounding.

Source: Energy Information Administration, *International Energy Annual 1987* (October 1988).

Figure 112. International Natural Gas Flow, 1986
(Billion Cubic Feet)


50
748
9
See Inset
105
124
739
509
50
78
Norway North Sea
923
448
United Kingdom
57
59
Nether lands
1,234
700
168
129
230
520
255
East Germ.
Poland
240
USSR
2778
Czech.
400
West Germany
138
France
193
315
270
152
270
Aust.
168
Hungary
70
Romania
138
Yugoslavia
220
Bulgaria
Finland
44
90
Spain
30
57
283
Italy
728
Algeria
24
Tunisia
From Libya
30

Note: Arrows indicate origins and destinations but not necessarily specific routes. Several minor routes and quantities are not shown.
Source: See Table 112.

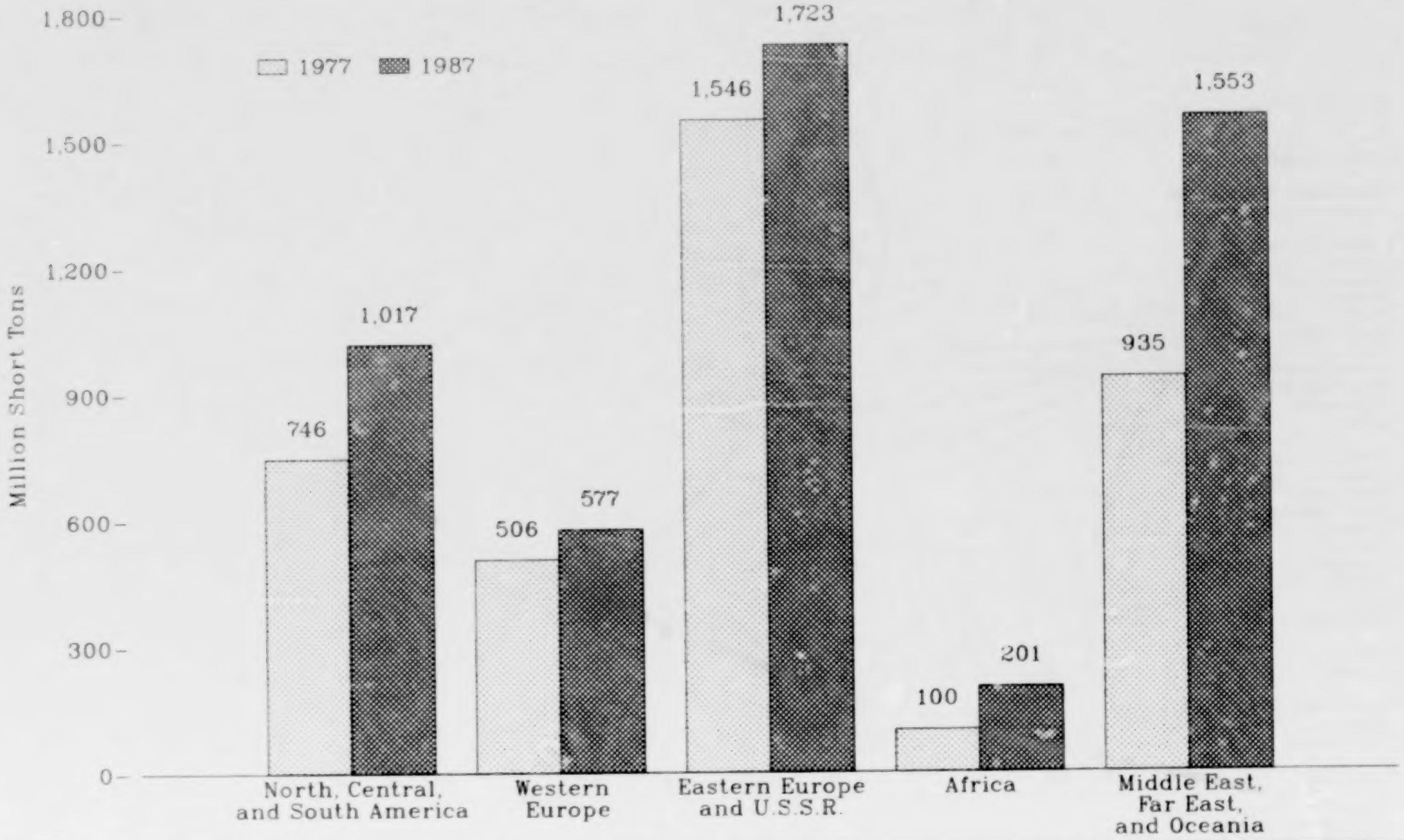
Table 112. International Natural Gas Flow, 1986

(Billion Cubic Feet)

Importing Area and Country	Exporting Area or Country													
	North and South America			Western Europe			Eastern Europe			Africa		Far East and Oceania		
	Canada	United States	Other	Netherlands	Norway	Other	U.S.S.R.	Other	Middle East[1]	Algeria	Libya	Indonesia	Other	Total
North America														
Canada	—	9	—	—	—	—	—	—	—	—	—	—	—	9
Mexico	—	2	—	—	—	—	—	—	—	—	—	—	—	2
United States	748	—	—	—	—	—	—	—	—	—	—	[2] 2	—	749
Central and South America														
Argentina	—	—	78	—	—	—	—	—	—	—	—	—	—	78
Western Europe														
Austria	—	—	—	—	—	5	138	—	—	—	—	—	—	143
Belgium and Luxembourg	—	—	—	168	57	—	—	—	—	[2] 90	—	—	—	315
France	—	—	—	193	129	—	315	—	—	[2] 270	—	—	—	907
Italy	—	—	—	152	—	—	270	—	—	283	—	—	—	705
Netherlands	—	—	—	—	59	—	—	—	—	—	—	—	—	59
Spain	—	—	—	—	—	—	—	—	—	[2] 57	[2] 30	—	—	[2] 87
United Kingdom	—	—	—	—	448	—	—	—	—	—	—	—	—	448
West Germany	—	—	—	700	230	13	520	—	—	[2] 4	—	—	—	1,467
Yugoslavia	—	—	—	—	—	—	138	—	—	—	—	—	—	138
Other	—	—	—	21	—	42	44	—	—	—	—	—	—	107
Eastern Europe and U.S.S.R.														
Bulgaria	—	—	—	—	—	—	220	—	—	—	—	—	—	220
Czechoslovakia	—	—	—	—	—	—	400	2	—	—	—	—	—	402
East Germany	—	—	—	—	—	—	255	—	—	—	—	—	—	255
Hungary	—	—	—	—	—	—	168	—	—	—	—	—	—	168
Poland	—	—	—	—	—	—	240	—	—	—	—	—	—	240
Romania	—	—	—	—	—	—	70	—	—	—	—	—	—	70
U.S.S.R.	—	—	—	—	—	—	—	—	—	—	—	—	105	105
Middle East	—	—	—	—	—	—	—	—	18	—	—	—	—	18
Africa														
Tunisia	—	—	—	—	—	—	—	—	—	24	—	—	—	24
Far East and Oceania														
Japan	—	[2] 50	—	—	—	—	—	—	[2] 106	—	—	[2] 732	[2] 509	1,397
South Korea	—	—	—	—	—	—	—	—	—	—	—	[2] 5	—	[2] 5
World Total	748	61	78	1,234	923	60	2,778	2	[2] 124	728	[2] 30	[2] 739	614	8,118

[1] United Arab Emirates and Iraq.
[2] Liquefied natural gas.
— = Not applicable.
Note: Sum of components may not equal total due to independent rounding.
Source: Energy Information Administration, *International Energy Annual 1987* (October 1988).

Figure 113. World Coal Production, 1977 and 1987



Source: See Table 113.

Table 113. World Coal Production, 1977-1987

(Million Short Tons)

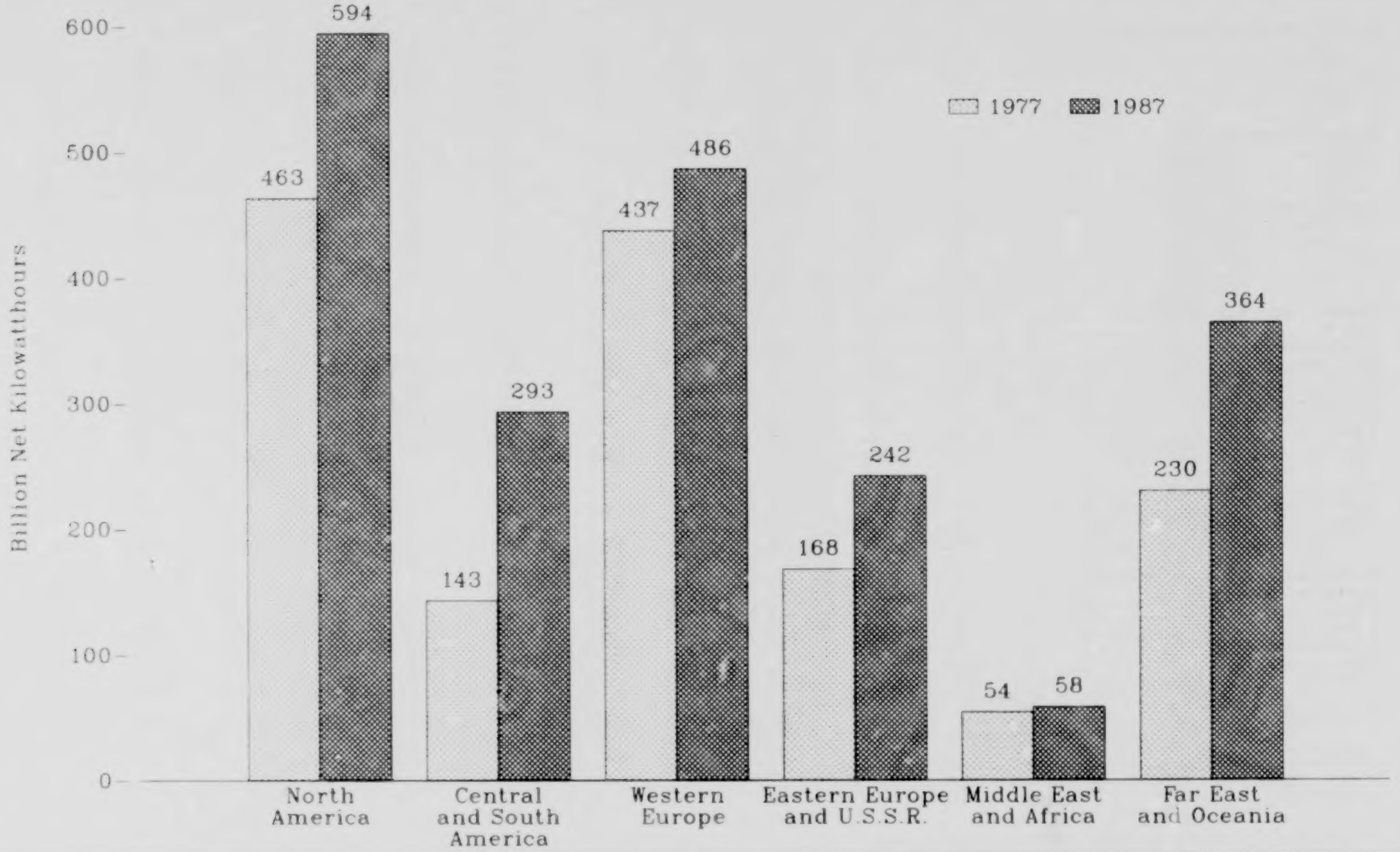
Area and Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987[1]
North, Central, and South America											
Canada	32	34	37	40	44	47	50	63	67	64	67
United States	697	670	781	830	824	838	782	896	884	890	919
Other	17	17	24	24	22	25	25	28	30	33	33
Total	746	721	842	894	890	910	857	987	981	987	1,017
Western Europe											
Greece	26	25	26	26	30	30	33	35	40	42	47
Spain	19	22	24	32	38	43	44	44	44	42	45
Turkey	13	15	22	18	19	24	32	38	43	51	52
United Kingdom	135	136	135	141	138	137	127	55	104	119	115
West Germany	229	228	239	239	241	247	236	233	231	222	211
Yugoslavia	43	44	46	52	58	60	65	72	75	77	83
Other	41	39	37	35	37	36	34	33	33	31	24
Total	506	509	529	543	561	577	571	510	570	584	577
Eastern Europe and U.S.S.R.											
Bulgaria	28	28	31	33	32	35	36	36	34	35	39
Czechoslovakia	134	136	137	136	137	139	140	143	140	139	139
East Germany	280	279	282	285	294	304	309	327	344	343	342
Poland	250	258	264	254	219	250	258	267	275	286	293
Romania	30	32	36	39	41	42	39	49	51	52	52
U.S.S.R.	796	798	792	790	776	792	789	785	798	825	830
Other	28	29	29	29	30	31	30	28	29	29	28
Total	1,546	1,560	1,571	1,566	1,529	1,593	1,601	1,635	1,671	1,709	1,723
Africa											
South Africa	94	100	114	127	144	151	161	179	192	195	194
Other	6	6	7	6	5	6	6	5	6	6	7
Total	100	106	121	133	149	157	167	184	198	201	201
Middle East, Far East, and Oceania											
Australia	111	114	119	116	130	140	146	153	186	187	206
China	606	681	698	684	683	734	788	870	937	959	1,014
India	115	116	118	125	142	148	158	168	173	188	203
North Korea	45	45	48	50	50	52	50	51	53	54	54
Other	58	59	60	62	64	63	64	66	74	76	76
Total	935	1,015	1,043	1,037	1,069	1,137	1,206	1,308	1,423	1,464	1,553
World Total	3,834	3,911	4,105	4,173	4,198	4,375	4,402	4,623	4,844	4,944	5,071

[1] Preliminary.

Note: Sum of components may not equal total due to independent rounding.

Sources: **United States:** •1987—Energy Information Administration, *Weekly Coal Production.* **All Other Data:** Energy Information Administration, *International Energy Annual 1987* (October 1988).

Figure 114. World Hydroelectric Power Generation, 1977 and 1987



Source: See Table 114.

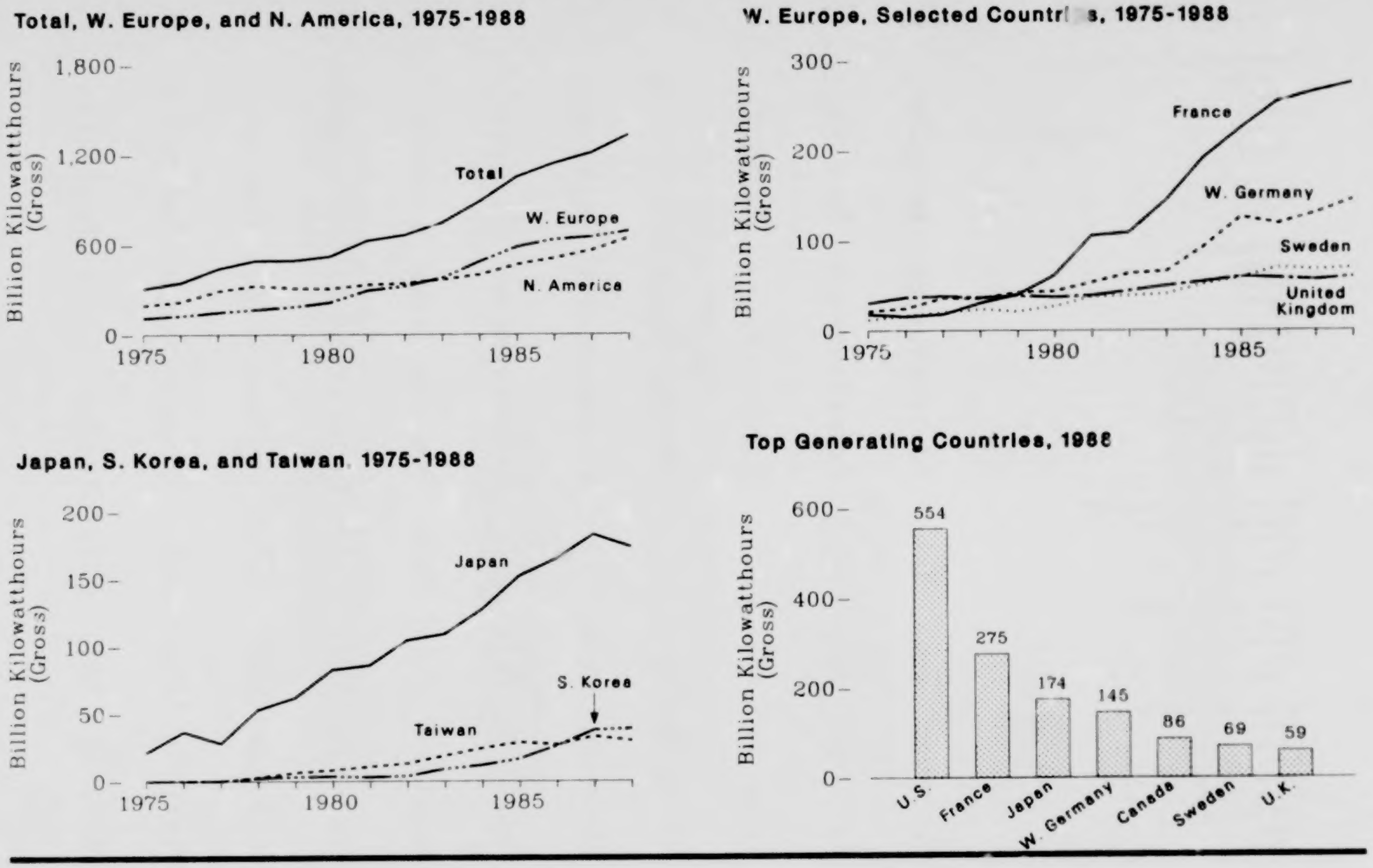
Table 114. World Hydroelectric Power Generation,[1] 1977-1987

(Billion Net Kilowatthours)

Area and Country	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987[2]
North, Central, and South America											
Argentina	6	8	11	15	15	17	18	20	20	21	21
Brazil	94	103	115	127	130	140	150	165	177	181	185
Canada	220	234	243	251	263	255	263	283	301	308	313
Colombia	11	12	13	15	18	18	19	19	19	20	20
Mexico	19	16	18	17	25	23	21	24	26	28	28
United States	224	284	283	279	264	312	335	324	284	294	253
Venezuela	12	12	13	15	15	16	18	20	21	21	22
Other	20	23	25	28	28	34	37	39	42	44	46
Total	606	692	721	747	758	815	861	894	890	917	887
Western Europe											
Austria	25	25	28	29	31	31	30	29	31	32	32
Finland	12	10	11	10	13	13	13	13	12	12	13
France	76	69	67	69	73	71	71	67	64	64	72
Italy	53	47	48	49	45	44	44	45	44	44	42
Norway	72	80	88	83	92	92	105	105	102	96	103
Portugal	10	11	12	8	5	7	8	10	11	8	9
Spain	40	41	47	31	23	28	29	33	33	27	28
Sweden	53	57	60	59	60	55	64	67	70	60	70
Switzerland	36	33	32	34	36	37	36	31	32	34	35
West Germany	17	18	18	21	20	19	19	18	17	18	20
Yugoslavia	24	25	26	28	25	23	22	25	23	27	27
Other	19	20	24	23	27	29	25	30	28	29	35
Total	437	436	461	444	450	449	466	473	467	451	486
Eastern Europe and U.S.S.R.											
Romania	9	11	11	13	13	12	10	11	12	12	12
U.S.S.R.	146	168	170	182	185	173	179	201	212	214	215
Other	13	12	14	15	14	13	15	15	16	15	15
Total	168	191	195	210	212	198	204	227	240	241	242
Middle East and Africa											
Egypt	9	9	9	10	10	10	10	10	11	11	11
Zambia	9	8	9	9	10	10	10	10	10	10	10
Other	36	39	46	50	43	42	41	37	37	37	37
Total	54	56	64	69	63	62	61	57	58	58	58
Far East and Oceania											
Australia	14	15	16	17	15	14	13	13	15	15	14
China	47	44	50	58	65	74	86	86	92	99	100
India	38	47	45	46	49	48	50	53	51	53	54
Japan	76	74	84	91	90	83	87	73	87	86	86
Korea, North	17	19	20	22	23	25	26	27	28	29	30
New Zealand	14	16	15	16	19	18	19	20	20	22	22
Other	24	26	32	31	33	35	43	49	50	56	58
Total	230	241	262	281	294	297	321	321	343	360	364
World Total	1,495	1,616	1,702	1,750	1,776	1,820	1,913	1,971	1,998	2,026	2,038

[1] See Appendix E, Note 1.
[2] Preliminary.
Note: Data include industrial and utility generation of hydroelectric power.
Note: Sum of components may not equal total due to independent rounding.
Source: Energy Information Administration, *International Energy Annual 1987* (October 1988).

Figure 115. Nuclear Electricity Generation by Non-Communist Countries



Total, W. Europe, and N. America, 1975-1988

W. Europe, Selected Countries, 1975-1988

Japan, S. Korea, and Taiwan, 1975-1988

Top Generating Countries, 1988

Source: See Table 115.

Table 115. Nuclear Electricity Generation[1] by Non-Communist Countries, 1975-1988

(Billion Gross Kilowatthours)

Country	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
North America														
Canada	13.2	18.0	26.6	33.0	38.4	40.4	43.3	42.6	53.0	53.8	62.9	74.6	80.6	85.6
United States	182.3	201.8	264.2	292.4	270.6	265.4	288.5	298.6	313.6	343.8	402.6	432.9	477.9	554.1
Total	195.5	219.8	290.8	325.4	309.0	305.8	331.8	341.2	366.6	397.6	465.5	507.6	558.5	639.7
Central and South America														
Argentina	2.5	2.6	1.6	2.9	2.7	2.3	2.8	1.9	3.4	4.5	5.8	5.7	5.2	5.1
Brazil	0	0	0	0	0	0	0	0.1	0.2	2.1	3.4	0.1	1.0	0.3
Total	2.5	2.6	1.6	2.9	2.7	2.3	2.8	1.9	3.6	6.6	9.1	5.8	6.2	5.5
Western Europe														
Belgium	6.8	10.0	11.9	12.5	11.4	12.5	12.8	15.6	24.1	27.7	34.5	38.6	41.9	43.1
Finland	0	0	2.7	3.3	6.7	7.0	14.5	16.5	17.4	18.5	18.8	18.8	19.4	19.3
France	18.3	15.8	17.9	30.6	39.9	61.2	105.2	108.9	144.2	191.2	224.0	254.3	265.5	274.9
Italy	3.8	3.8	3.4	4.5	2.6	2.2	2.7	6.8	5.8	6.9	7.0	8.7	0.2	0
Netherlands	3.3	3.9	3.7	4.1	3.5	4.2	3.7	3.9	3.6	3.8	3.9	4.2	3.6	3.7
Spain	7.5	7.6	6.5	7.6	6.7	5.2	9.4	8.8	10.7	23.1	28.0	37.5	41.2	49.2
Sweden	12.0	16.0	19.9	23.8	21.0	26.7	37.7	38.8	40.4	51.3	58.6	69.9	67.2	69.4
Switzerland	7.7	7.9	8.1	8.3	11.8	14.3	15.2	15.0	15.5	16.3	22.4	22.5	23.0	22.7
United Kingdom	30.5	36.8	38.1	36.6	38.5	37.2	38.9	44.1	49.6	54.1	59.6	58.2	56.2	59.4
West Germany	21.7	24.5	36.0	35.7	42.2	43.7	53.4	63.4	65.8	92.6	125.8	118.9	130.2	145.2
Total	111.7	126.2	148.1	166.9	184.3	214.2	293.4	321.8	377.2	485.4	582.6	631.5	648.3	686.9
Far East and Africa														
India	2.5	3.2	2.8	2.3	3.2	2.9	3.1	2.2	2.9	4.1	4.5	5.1	5.5	6.1
Japan	21.3	36.6	28.2	53.1	62.0	82.8	86.0	104.5	109.1	127.2	152.0	164.8	182.8	173.6
Pakistan	0.5	0.5	0.3	0.2	[2]	0.1	0.2	0.1	0.2	0.3	0.3	0.5	0.3	0.2
South Africa	0	0	0	0	0	0	0	0	0	4.2	5.7	9.3	6.6	11.1
South Korea	0	0	0.1	2.3	3.2	3.5	2.9	3.8	9.0	11.8	16.5	26.1	37.8	38.7
Taiwan	0	0	0.1	2.7	6.3	8.2	10.7	13.1	18.9	24.3	28.7	26.9	33.1	29.9
Total	24.4	40.3	31.5	60.6	74.7	97.4	102.9	123.6	140.1	171.9	207.8	232.9	266.1	259.6
Total	334.1	388.9	472.0	555.9	570.7	619.8	730.9	788.5	887.5	1.061.5	1,265.0	1,377.8	1,479.1	1,591.6

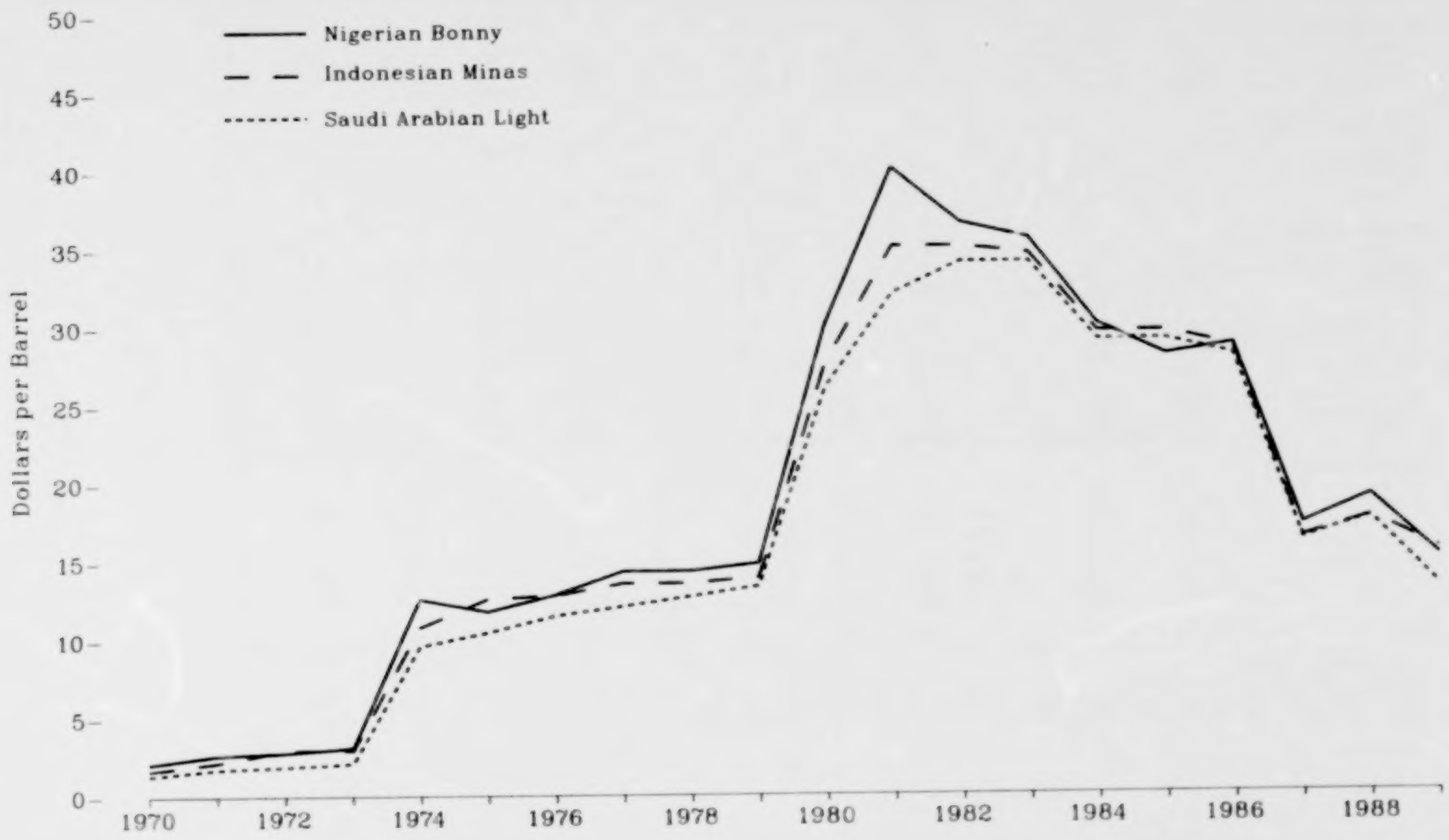
[1] See Appendix E, Note 1.

[2] Less than 0.05 billion gross kilowatthours.

Note: Sum of components may not equal total due to independent rounding.

Source: *Nucleonics Week*, McGraw-Hill Publishing Co., Inc.

Figure 116. Official Prices of Selected Foreign Crude Oils, 1970–1989[a]



[a]As of January 1, except in 1987, when prices are as of February 1.
Source: See Table 116.

Table 116. Official Prices[1] of Selected Foreign Crude Oils, 1970-1989[2]

(Dollars per Barrel)

Year	Saudi Arabian Light-34° API	Iranian Light-34° API	Libyan[3] Es Sider-37° API	Nigerian[4] Bonny-37° API	Indonesian Minas-34° API	Venezuelan Tia Juana-26° API	Mexico[5] Maya-22° API	United Kingdom[6] Brent Blend-38° API
1970	1.35	1.36	2.09	2.10	1.67	2.05	NA	NA
1971	1.75	1.76	2.80	2.65	2.18	2.45	NA	NA
1972	1.90	1.91	2.80	2.80	2.96	2.45	NA	NA
1973	2.10	2.11	3.10	3.10	2.96	2.60	NA	NA
1974	9.60	10.63	14.30	12.60	10.80	9.30	NA	NA
1975	10.46	10.67	11.98	11.80	12.60	11.00	NA	NA
1976	11.51	11.62	12.21	12.84	12.80	11.12	NA	NA
1977	12.09	12.81	13.74	14.33	13.55	12.72	NA	NA
1978	12.70	12.81	13.80	14.33	13.55	12.82	NA	NA
1979	13.34	13.45	14.52	14.80	13.90	13.36	15.45	15.70
1980	26.00	[7] 30.00	34.50	29.97	27.50	25.20	28.00	26.02
1981	32.00	37.00	40.78	40.00	35.00	32.88	34.50	39.25
1982	34.00	34.20	36.50	36.50	35.00	32.88	26.50	36.60
1983	34.00	31.20	35.10	35.50	34.53	32.88	25.50	33.50
1984	29.00	28.00	30.15	30.00	29.53	27.88	25.00	30.00
1985	29.00	28.00	30.15	28.00	29.53	27.88	25.50	28.65
1986	28.00	28.05	30.15	28.65	28.53	27.10	21.93	26.00
1987	16.15	16.14	16.95	17.13	16.28	14.45	14.00	18.25
1988	17.52	15.55	18.52	18.92	17.56	16.72	11.10	18.00
1989	13.15	12.75	15.40	15.05	15.50	11.40	10.63	15.80

[1] Prices are usually free on board (f.o.b.) at the foreign port of lading. Prices for the period mid-1974 forward are official selling prices.

[2] As of January 1, except in 1987, when prices are as of February 1 (see Note below).

[3] Prices for 1974 and 1975 are for 40 degrees API gravity. Prices for 1980 include $4.72 in retroactive charges and market premiums.

[4] Prices from 1977 forward include 2 cents per barrel harbor dues.

[5] Mexico does not post official crude oil prices. Prices are formula-determined for each contract. For example, the prices given here are for f.o.b. deliveries to Houston, Texas. They are based on a variety of U.S. domestic crude oil postings and on quotations for fuel oil imports into U.S. Gulf of Mexico ports.

[6] The United Kingdom does not post official crude oil prices. Prices for 1979 through 1984 are estimated long-term contract prices; prices for 1985 and forward are contractural arrangements based on spot market quotations.

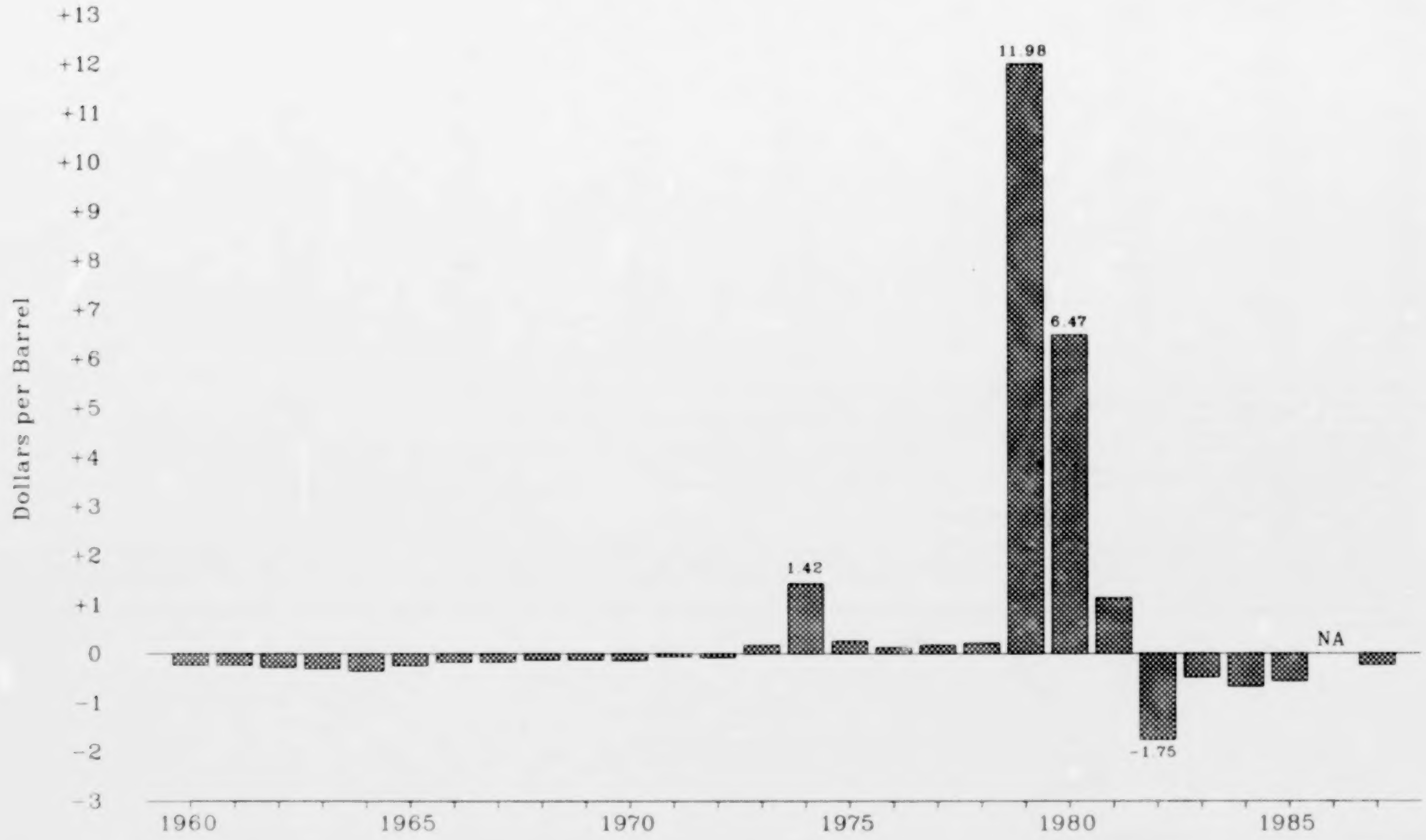
[7] Price for 1980 includes $1.87 market premiums and credit charges.

NA = Not available.

Note: The Organization of Petroleum Exporting Countries (OPEC) adopted major changes in their crude oil pricing system at the beginning of 1986. The primary result of these changes was a switch from official prices to netback arrangements and spot crude oil sales for the January 1986 through January 1987 time period. On February 1, 1987, official contract prices were again being used by OPEC as their primary pricing mechanism. However, subsequently in 1987 all OPEC producers moved to spot crude oil sales as a basis for their crude oil pricing systems. Spot market related pricing continued through 1988 and into 1989.

Sources: •1970 through 1978—Petroleum and Energy Intelligence Weekly, Inc., *Petroleum Intelligence Weekly*. •1979 and forward—Energy Information Administration, *Weekly Petroleum Status Report*.

Figure 117. Difference Between Spot and Official Prices of Mideast Light Crude 34, 1960-1987



NA = Not available.
Source: See Table 117.

Table 117. Differences Between Average Annual Spot Prices and Official Prices for Selected Foreign Crude Oil Mixes, 1960-1987

(Dollars per Barrel)

	Mideast Light Crude -34 [1]			Mideast Heavy Crude -31 [2]			Mideast Heavy Crude -27 [3]			North Sea/African Crude -37/44 [4]		
Year	Official Price	Spot Price [5]	Difference [6]	Official Price	Spot Price	Difference [6]	Official Price	Spot Price [5]	Difference [6]	Official Price	Spot Price [5]	Difference [6]
1960	1.86	1.63	-0.23	1.64	1.46	-0.18	NA	NA	NA	NA	NA	NA
1961	1.80	1.57	-0.23	1.59	1.41	-0.18	NA	NA	NA	NA	NA	NA
1962	1.80	1.52	-0.28	1.59	1.38	-0.21	NA	NA	NA	2.23	NA	NA
1963	1.80	1.50	-0.30	1.59	1.35	-0.24	NA	NA	NA	2.23	1.85	-0.38
1964	1.80	1.45	-0.35	1.59	1.33	-0.26	NA	NA	NA	2.23	1.73	-0.50
1965	1.66	1.42	-0.24	1.45	1.31	-0.14	NA	NA	NA	2.00	1.68	-0.32
1966	1.53	1.36	-0.17	1.38	1.28	-0.10	NA	NA	NA	1.90	1.63	-0.27
1967	1.50	1.33	-0.17	1.35	1.27	-0.08	NA	NA	NA	1.95	1.76	-0.19
1968	1.45	1.32	-0.13	1.32	1.24	-0.08	NA	NA	NA	2.00	1.88	-0.12
1969	1.40	1.27	-0.13	1.30	1.20	-0.10	NA	NA	NA	1.95	1.83	-0.12
1970	1.35	1.21	-0.14	1.30	1.15	-0.15	NA	NA	NA	2.10	2.26	0.16
1971	1.75	1.69	-0.06	1.68	1.61	-0.07	NA	NA	NA	2.35	2.66	0.31
1972	1.90	1.82	-0.08	1.80	1.71	-0.09	NA	NA	NA	2.80	2.69	-0.11
1973	[7] 2.64	2.81	0.17	2.04	2.07	0.03	NA	NA	NA	3.20	3.40	0.20
1974	[7] 9.56	10.98	1.42	9.44	10.25	0.81	NA	NA	NA	11.40	12.92	1.52
1975	10.46	10.71	0.25	10.37	10.35	-0.02	NA	NA	NA	11.61	11.50	-0.11
1976	11.51	11.63	0.12	11.26	11.25	-0.01	NA	NA	NA	12.97	13.14	0.17
1977	12.40	12.57	0.17	12.37	12.23	-0.14	NA	NA	NA	14.48	14.30	-0.18
1978	12.70	12.91	0.21	12.27	12.26	-0.01	NA	NA	NA	14.10	14.21	0.11
1979	17.84	29.82	11.98	18.04	27.04	9.00	NA	NA	NA	21.04	32.11	11.07
1980	29.38	35.85	6.47	29.81	34.34	4.53	NA	NA	NA	36.50	37.89	1.39
1981	33.16	34.29	1.13	33.74	32.96	-0.78	NA	NA	NA	39.39	36.68	-2.71
1982	33.51	31.76	-1.75	31.38	30.36	-1.02	31.00	28.98	-2.02	34.75	33.42	-1.33
1983	29.20	28.72	-0.48	27.50	27.61	0.11	26.83	26.50	-0.33	30.72	29.82	-0.90
1984	28.75	28.08	-0.67	NA	NA	NA	27.10	27.26	0.16	29.95	28.81	-1.14
1985	28.08	27.52	-0.56	NA	NA	NA	26.29	25.78	-0.51	28.62	27.88	-0.74
1986[8]	NA	13.84	NA	NA	NA	NA	NA	11.94	NA	NA	15.41	NA
1987	17.52	17.29	-0.23	NA	NA	NA	16.27	16.13	-0.14	18.92	18.51	-0.41

[1] Primarily Arabian Light Crude Oil, 34 degrees API. Beginning in 1985, data are for Arabian Light Crude Oil, 34 degrees API only.

[2] Primarily Kuwait Heavy Crude Oil, 31 degrees API.

[3] In 1984, Mideast Heavy was redefined and is now primarily Arabian Heavy Crude Oil, 27 degrees API and prices were computed for 1982 and forward. Beginning in 1985, data are for Arabian Heavy, 27 degrees API only.

[4] Primarily Libyan Brega Crude Oil, 40 degrees API during the 1960's. Broadened to include Algeria Saharan Crude Oil, 44 degrees API and Nigerian Bonny, 37 degrees API from 1970 through 1980. Further broadened in 1981 to include United Kingdom-Brent, 38 degrees API and Norway-Ekofisk, 43 degrees API. Beginning in 1985, data are for Nigerian Bonny, 37 degrees API only.

[5] For 1986, this price is the market-related price, see Footnote 8.

[6] Spot price minus official price.

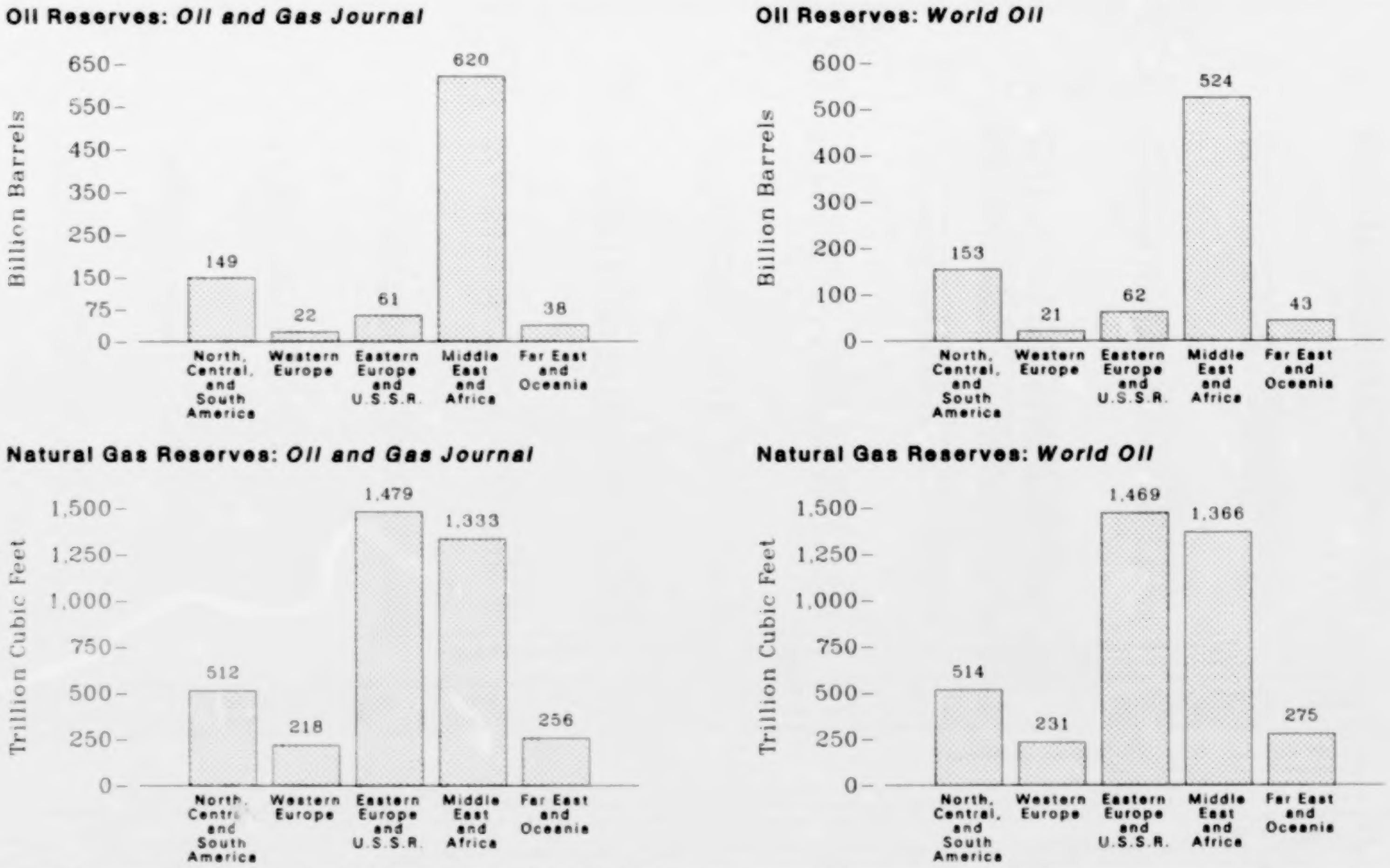
[7] Actual contract prices for Arabian Light Crude -34 degrees API. Although an official Arabian Light Crude -34 degrees API price existed, it applied to only a few direct sales contracts.

[8] For 1986, official prices were replaced by market-related pricing mechanisms, such as the netback prices indicated for 1986. Netback arrangements are crude oil price contracts based on the prices of petroleum products in the final market. For 1987 and before 1986, official sales prices were used as the primary indicator of long-term crude oil contract prices.

NA = Not available.

Sources: Petroleum and Energy Intelligence Weekly, Inc., *Petroleum Intelligence Weekly*. McGraw-Hill Inc., *Platt's Oilgram Price Report*.

Figure 118. World Crude Oil and Natural Gas Reserves, January 1, 1988



Oil Reserves: *Oil and Gas Journal*

Oil Reserves: *World Oil*

Natural Gas Reserves: *Oil and Gas Journal*

Natural Gas Reserves: *World Oil*

Source: See Table 118.

Table 118. World Crude Oil and Natural Gas Reserves, January 1, 1988

Region Country	Crude Oil (billion barrels)		Natural Gas (trillion cubic feet)	
	Oil and Gas Journal	*World Oil*	*Oil and Gas Journal*	*World Oil*
North America				
Canada	6.9	4.8	98.0	95.6
Mexico	48.6	54.1	76.5	74.8
United States	27.3	27.3	187.2	187.2
Total	82.8	86.3	361.7	357.6
Central and South America				
Argentina	2.3	2.3	23.6	24.5
Bolivia	0.2	0.2	5.0	5.3
Brazil	2.3	2.6	3.6	3.7
Colombia	1.6	2.0	3.6	3.9
Ecuador	1.6	1.6	4.0	4.0
Trinidad and Tobago	0.6	0.5	10.4	10.2
Venezuela	56.3	56.8	95.0	100.2
Other	0.9	1.0	4.9	4.8
Total	65.8	67.0	150.1	156.6
Western Europe				
Denmark	0.4	0.6	4.4	2.9
Italy	0.7	0.9	10.2	10.2
Netherlands	0.2	0.2	64.1	62.5
Norway	14.8	12.5	105.9	116.4
United Kingdom	5.2	5.2	22.0	22.7
West Germany	0.3	0.4	6.4	9.6
Other	0.8	0.9	5.1	6.2
Total	22.4	20.7	218.1	230.5
Eastern Europe and U.S.S.R.				
U.S.S.R.	59.0	58.7	1,450.0	1,448.0
Other [2]	1.8	2.8	29.3	20.5
Total	60.8	61.5	1,479.3	1,468.5
Middle East				
Bahrain	0.1	0.1	6.9	6.7
Iran	92.9	35.6	489.4	497.0
Iraq	100.0	100.0	26.3	95.0
Kuwait [1]	94.5	98.1	42.6	41.5
Oman	4.0	4.1	9.5	9.3
Qatar	3.2	3.5	156.7	163.2
Saudi Arabia [1]	169.6	170.0	146.1	145.9
United Arab Emirates	98.1	56.2	203.5	197.5
Other	2.4	2.8	3.1	10.4
Total	564.8	470.4	1,084.1	1,166.5
Africa				
Algeria	8.5	4.9	105.9	105.9
Cameroon	0.5	0.5	3.9	3.9
Egypt	4.3	4.7	10.2	9.4
Libya	21.0	22.6	25.7	25.7
Nigeria	16.0	15.8	84.0	45.6
Tunisia	1.8	1.7	3.0	3.0
Other	3.0	3.7	16.0	5.7
Total	55.1	53.9	248.7	199.2
Far East and Oceania				
Australia	1.7	2.2	18.6	29.8
Brunei	1.4	1.6	7.0	12.0
China	18.4	22.3	30.7	30.2
India	4.3	4.4	17.6	17.8
Indonesia	8.4	8.5	73.0	87.0
Malaysia	2.9	3.3	52.2	52.2
New Zealand	0.2	0.2	5.2	4.1
Pakistan	0.1	0.1	22.4	17.8
Thailand	0.1	0.1	3.7	3.7
Other	0.4	0.5	25.1	20.7
Total	37.9	43.2	255.5	275.3
World Total	889.5	803.0	3,797.6	3,854.3

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[1] Includes one-half of the reserves in the Neutral Zone between Kuwait and Saudi Arabia.

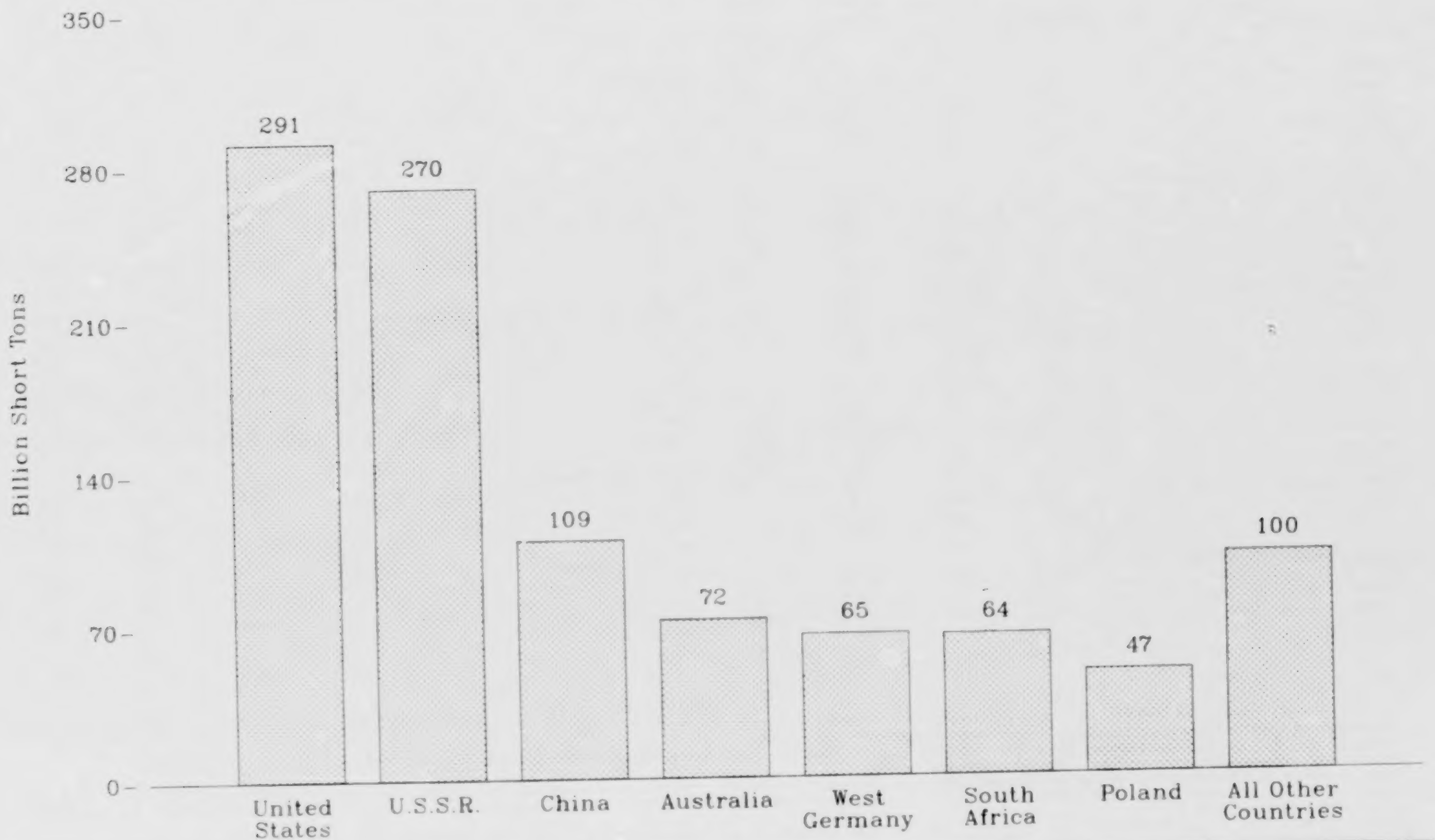
[2] Includes Albania, Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, North Korea, Poland, Romania, Yugoslavia, and Vietnam.

Note: Sum of components may not equal total due to independent rounding.

Note: All reserve figures except those for the U.S.S.R. and natural gas reserves in Canada are proved reserves recoverable with present technology and prices. U.S.S.R. figures are "explored reserves," which include proved, probable, and some possible. The Canadian natural gas figure includes proved and some probable. The latest Energy Information Administration data for the United States are for December 31, 1987. See Table 44.

Sources: **United States:** Energy Information Administration, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves, 1987 Annual Report* (October 1988). **All Other Data:** PennWell Publishing Company, *Oil and Gas Journal*, December 28, 1987. Gulf Publishing Company, *World Oil*, August 1988. The Energy Information Administration does not certify the international reserves data; they are published here for the convenience of the reader.

Figure 119. World Recoverable Reserves of Coal



Note: The reference year for most of the reserve data is 1984.
Source: See Table 119.

Table 119. World Recoverable Reserves of Coal

(Billion Short Tons)

Area and Country	Anthracite and Bituminous Coal [1]: Recoverable	Anthracite and Bituminous Coal [1]: Portion Surface Minable	Anthracite and Bituminous Coal [1]: Portion Coking Quality	Lignite: Recoverable	Lignite: Portion Surface Minable	Total Recoverable
North, Central, and South America						
Canada	4.88	4.10	2.58	2.67	2.67	7.55
United States	254.78	64.37	NA	36.06	36.06	290.84
Other	7.77	3.02	1.77	0.02	0.00	7.79
Total	267.43	[2]71.49	[2]4.35	38.75	38.73	306.18
Western Europe						
Turkey	0.10	0.00	0.09	5.25	3.68	5.35
United Kingdom	5.07	0.00	1.98	0.00	0.00	5.07
West Germany	26.37	NA	15.82	38.75	38.75	65.12
Yugoslavia	1.73	0.58	0.00	16.50	13.20	18.23
Other	2.22	[2]0.31	[2]0.61	3.69	0.36	5.91
Total	35.49	[2]0.89	[2]18.50	64.19	[2]55.99	99.68
Eastern Europe and U.S.S.R.						
Bulgaria	0.03	NA	0.02	4.00	2.60	4.03
Czechoslovakia	3.00	NA	NA	3.15	0.00	6.15
Hungary	1.74	0.00	0.17	3.18	3.18	4.92
Poland	31.20	0.00	10.00	15.88	14.33	47.08
U.S.S.R.	165.56	39.11	60.00	104.20	96.88	269.76
Other	0.00	0.00	0.00	23.00	23.00	23.00
Total	201.53	[2]39.11	[2]70.19	153.41	[2]139.99	354.94
Africa						
Botswana	3.85	0.00	0.00	0.00	0.00	3.85
South Africa	64.38	NA	NA	0.00	0.00	64.38
Swaziland	1.00	0.00	0.00	0.00	0.00	1.00
Other	2.06	0.56	0.55	0.00	0.00	2.06
Total	71.29	[2]0.56	[2]0.55	0.00	0.00	71.29
Middle East, Far East, and Oceania						
Australia	32.53	7.26	12.10	39.90	39.90	72.43
China	108.90	14.16	32.67	0.00	0.00	108.90
India	NA	NA	NA	1.74	1.65	1.74
Other	2.50	[2]0.07	[2]0.71	0.92	0.70	3.42
Total	143.93	[2]21.49	[2]45.48	42.56	[2]42.25	186.49
World Total	719.67	[2]133.54	[2]139.07	298.91	[2]276.96	1,018.58

[1] Includes subbituminous coal.
[2] Not all countries in this group reported under this category.
NA = Not available.
Note: The reference year for most of the reserves data is 1984.
Note: Sum of components may not equal total due to independent rounding.
Source: Energy Information Administration, *International Energy Annual 1987* (October 1988).

Appendix A. Thermal Conversion Factors

Using Thermal Conversion Factors

The thermal conversion factors presented in the following seven tables can be used to estimate the heat content in British thermal units[1] (Btu) of a given amount of energy measured in physical units such as barrels or cubic feet. For example, 10 barrels of asphalt has a heat content of approximately 66.36 million Btu (10 barrels X 6.636 million Btu/barrel = 66.36 million Btu).

In general, the annual thermal conversion factors presented in Tables A2 through A7 are computed from final annual data. However, if the current year's final data are not available in time for publication, thermal conversion factors for the current year are computed from the best available data and are labeled "preliminary." The source of each factor is described in a section entitled "Thermal Conversion Factor Source Documentation," which follows Table A7 in this appendix.

Thermal conversion factors for hydrocarbon mixes are weighted averages of the thermal conversion factors for each hydrocarbon included in the mix. For example, in calculating the thermal conversion factor for a 60/40 butane/propane mixture, the thermal conversion factor for butane is weighted 1.5 times more heavily than the thermal conversion factor for propane.

Table A1. Approximate Heat Content of Petroleum Products and Wood

Energy Source	Heat Content
	Million Btu per Barrel
Asphalt	6.636
Aviation Gasoline	5.048
Butane	4.326
Butane-Propane Mixture (60 percent/40 percent)	4.130
Distillate Fuel Oil	5.825
Ethane	3.082
Ethane-Propane Mixture (70 percent/30 percent)	3.308
Isobutane	3.974
Jet Fuel, Kerosene Type	5.670
Jet Fuel, Naphtha Type	5.355
Kerosene	5.670
Lubricants	6.065
Motor Gasoline	5.253
Natural Gasoline and Isopentane	4.620
Pentane Plus	4.620
Petrochemical Feedstocks	
Naphtha 400 °F or less	5.248
Other Oils over 400 °F	5.825
Still Gas	6.000
Petroleum Coke	6.024
Plant Condensate	5.418
Propane	3.836
Residual Fuel Oil	6.287
Road Oil	6.636
Special Naphthas	5.248
Still Gas	6.000
Unfinished Oils	5.825
Unfractionated Stream	5.418
Waxes	5.537
Miscellaneous	5.796
	Million Btu per Short Ton
Hardwood, dry (average)	17.2

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[1] More information about British thermal units—the standardized unit of measure for energy—can be found in Appendix B, "Energy Units in Perspective," and in the Glossary.

Table A2. Approximate Heat Content of Crude Oil,[1] Crude Oil and Products, and Natural Gas Plant Liquids, 1949-1988

(Million Btu per Barrel)

	Crude Oil Only			Crude Oil and Products		
Year	Production	Imports	Exports	Imports	Exports	Natural Gas Plant Liquids Production
1949	5.8	5.952	5.8	6.059	5.692	4.544
1950	5.8	5.943	5.8	6.080	5.766	4.522
1951	5.8	5.938	5.8	6.075	5.762	4.495
1952	5.8	5.938	5.8	6.067	5.774	4.464
1953	5.8	5.924	5.8	6.052	5.742	4.450
1954	5.8	5.931	5.8	6.052	5.745	4.415
1955	5.8	5.924	5.8	6.040	5.768	4.406
1956	5.8	5.916	5.8	6.024	5.754	4.382
1957	5.8	5.918	5.8	6.023	5.780	4.369
1958	5.8	5.916	5.8	5.993	5.779	4.366
1959	5.8	5.916	5.8	6.020	5.829	4.311
1960	5.8	5.911	5.8	6.021	5.834	4.295
1961	5.8	5.900	5.8	5.991	5.832	4.283
1962	5.8	5.890	5.8	6.004	5.841	4.273
1963	5.8	5.894	5.8	6.002	5.840	4.264
1964	5.8	5.882	5.8	5.998	5.844	4.268
1965	5.8	5.872	5.8	5.997	5.743	4.264
1966	5.8	5.863	5.8	5.993	5.729	4.259
1967	5.8	5.838	5.8	5.999	5.777	4.232
1968	5.8	5.836	5.8	5.977	5.763	4.218
1969	5.8	5.825	5.8	5.974	5.714	4.170
1970	5.8	5.822	5.8	5.985	5.810	4.146
1971	5.8	5.824	5.8	5.961	5.775	4.117
1972	5.8	5.809	5.8	5.935	5.741	4.070
1973	5.8	5.817	5.8	5.897	5.752	4.049
1974	5.8	5.827	5.8	5.884	5.774	4.011
1975	5.8	5.821	5.8	5.858	5.748	3.984
1976	5.8	5.808	5.8	5.856	5.745	3.964
1977	5.8	5.810	5.8	5.834	5.797	3.941
1978	5.8	5.802	5.8	5.839	5.808	3.925
1979	5.8	5.810	5.8	5.810	5.832	3.955
1980	5.8	5.812	5.8	5.796	5.820	3.914
1981	5.8	5.818	5.8	5.775	5.821	3.930
1982	5.8	5.826	5.8	5.775	5.820	3.872
1983	5.8	5.825	5.8	5.774	5.800	3.839
1984	5.8	5.823	5.8	5.745	5.850	3.812
1985	5.8	5.832	5.8	5.736	5.814	3.815
1986	5.8	5.903	5.8	5.808	5.832	3.797
1987	5.8	5.901	5.8	5.820	5.858	3.804
1988[2]	5.8	5.865	5.8	5.795	5.847	3.813

[1] Includes lease condensate.

[2] Preliminary.

Source: See "Thermal Conversion Factor Source Documentation," which follows Table A7.

Table A3. Approximate Heat Content of Petroleum Product Weighted Averages,[1] 1949-1988

(Million Btu per Barrel)

Year	Consumption					Imports	Exports
	Residential and Commercial	Industrial	Transportation	Electric Utilities	Total		
1949	5.631	5.947	5.465	6.254	5.649	6.261	5.651
1950	5.626	5.940	5.461	6.254	5.649	6.263	5.751
1951	5.626	5.913	5.458	6.254	5.634	6.265	5.753
1952	5.621	5.905	5.442	6.254	5.621	6.261	5.768
1953	5.606	5.897	5.426	6.254	5.608	6.268	5.732
1954	5.603	5.883	5.412	6.254	5.595	6.252	5.738
1955	5.607	5.866	5.408	6.254	5.591	6.234	5.765
1956	5.601	5.856	5.406	6.254	5.585	6.225	5.744
1957	5.587	5.842	5.405	6.254	5.577	6.219	5.774
1958	5.582	5.832	5.393	6.254	5.567	6.091	5.778
1959	5.549	5.811	5.389	6.254	5.557	6.142	5.830
1960	5.570	5.800	5.388	6.267	5.555	6.161	5.835
1961	5.570	5.795	5.386	6.268	5.552	6.102	5.833
1962	5.555	5.784	5.386	6.267	5.545	6.138	5.842
1963	5.532	5.759	5.384	6.266	5.534	6.126	5.841
1964	5.517	5.728	5.388	6.267	5.528	6.129	5.845
1965	5.535	5.728	5.387	6.267	5.532	6.123	5.742
1966	5.523	5.722	5.388	6.266	5.532	6.112	5.728
1967	5.473	5.682	5.391	6.266	5.515	6.128	5.758
1968	5.450	5.646	5.394	6.263	5.504	6.095	5.762
1969	5.399	5.603	5.394	6.259	5.492	6.093	5.713
1970	5.404	5.604	5.393	6.252	5.503	6.088	5.811
1971	5.392	5.600	5.389	6.245	5.504	6.062	5.775
1972	5.368	5.564	5.388	6.233	5.500	6.045	5.741
1973	5.387	5.568	5.395	6.245	5.515	5.983	5.752
1974	5.377	5.538	5.394	6.238	5.504	5.959	5.773
1975	5.358	5.528	5.392	6.250	5.494	5.935	5.747
1976	5.383	5.538	5.395	6.251	5.504	5.980	5.743
1977	5.389	5.555	5.400	6.249	5.518	5.908	5.796
1978	5.382	5.553	5.404	6.251	5.519	5.955	5.814
1979	5.471	5.418	5.428	6.258	5.494	5.811	5.864
1980	5.468	5.376	5.440	6.254	5.479	5.748	5.841
1981	5.409	5.313	5.432	6.258	5.448	5.659	5.837
1982	5.392	5.263	5.422	6.258	5.415	5.664	5.829
1983	5.286	5.272	5.416	6.255	5.406	5.677	5.800
1984	5.261	5.252	5.425	6.251	5.395	5.613	5.867
1985	5.203	5.261	5.423	6.247	5.387	5.572	5.819
1986	5.238	5.335	5.423	6.257	5.418	5.624	5.839
1987	5.245	5.291	5.424	6.249	5.403	5.599	5.860
1988[2]	5.239	5.277	5.423	6.250	5.404	5.597	5.841

[1] Weighted averages of the products included in each category are calculated using heat content values shown in Table A1.

[2] Preliminary.

Source: See "Thermal Conversion Factor Source Documentation," which follows Table A7.

Table A4. Approximate Heat Content of Natural Gas, 1949-1988

(Btu per Cubic Foot)

Year	Production		Consumption			Imports	Exports
	Dry	Marketed (Wet)	Non-Electric Utility Users	Electric Utilities	Total		
1949	1,035	1,120	1,035	1,035	1,035	—	1,035
1950	1,035	1,119	1,035	1,035	1,035	—	1,035
1951	1,035	1,114	1,035	1,035	1,035	—	1,035
1952	1,035	1,115	1,035	1,035	1,035	1,035	1,035
1953	1,035	1,116	1,035	1,035	1,035	1,035	1,035
1954	1,035	1,115	1,035	1,035	1,035	1,035	1,035
1955	1,035	1,120	1,035	1,035	1,035	1,035	1,035
1956	1,035	1,116	1,035	1,035	1,035	1,035	1,035
1957	1,035	1,113	1,035	1,035	1,035	1,035	1,035
1958	1,035	1,110	1,035	1,035	1,035	1,035	1,035
1959	1,035	1,109	1,035	1,035	1,035	1,035	1,035
1960	1,035	1,107	1,035	1,035	1,035	1,035	1,035
1961	1,035	1,108	1,035	1,035	1,035	1,035	1,035
1962	1,035	1,107	1,035	1,035	1,035	1,035	1,035
1963	1,031	1,103	1,031	1,031	1,031	1,031	1,031
1964	1,032	1,102	1,032	1,032	1,032	1,032	1,032
1965	1,032	1,101	1,032	1,032	1,032	1,032	1,032
1966	1,033	1,103	1,033	1,033	1,033	1,033	1,033
1967	1,032	1,105	1,032	1,032	1,032	1,032	1,032
1968	1,031	1,115	1,031	1,031	1,031	1,031	1,031
1969	1,031	1,103	1,031	1,031	1,031	1,031	1,031
1970	1,031	1,102	1,031	1,031	1,031	1,031	1,031
1971	1,031	1,103	1,031	1,031	1,031	1,031	1,031
1972	1,027	1,100	1,027	1,027	1,027	1,027	1,027
1973	1,021	1,093	1,020	1,024	1,021	1,026	1,023
1974	1,024	1,097	1,024	1,022	1,024	1,027	1,016
1975	1,021	1,095	1,020	1,026	1,021	1,026	1,014
1976	1,020	1,093	1,019	1,023	1,020	1,025	1,013
1977	1,021	1,093	1,019	1,029	1,021	1,026	1,013
1978	1,019	1,088	1,016	1,034	1,019	1,030	1,013
1979	1,021	1,092	1,018	1,035	1,021	1,037	1,013
1980	1,026	1,098	1,024	1,035	1,026	1,022	1,013
1981	1,027	1,103	1,025	1,035	1,027	1,014	1,011
1982	1,028	1,107	1,026	1,036	1,028	1,018	1,011
1983	1,031	1,115	1,031	1,030	1,031	1,024	1,010
1984	1,031	1,109	1,030	1,035	1,031	1,005	1,010
1985	1,032	1,112	1,031	1,038	1,032	1,002	1,011
1986	1,030	1,110	1,029	1,034	1,030	997	1,008
1987	1,031	1,112	1,031	1,032	1,031	999	1,011
1988[1]	1,031	1,112	1,031	1,032	1,031	999	1,011

[1] Preliminary.

— = Not applicable.

Source: See "Thermal Conversion Factor Source Documentation," which follows Table A7.

Table A5. Approximate Heat Content of Coal and Coal Coke, 1949-1988

(Million Btu per Short Ton)

	Coal								Coal Coke
		Consumption							
Year	Production	Residential and Commercial	Coke Plants	Other Industries [1]	Electric Utilities	Total	Imports	Exports	Imports and Exports
1949	24.916	24.263	26.797	24.612	23.761	24.793	25.000	26.759	24.800
1950	25.090	24.461	26.798	24.820	23.937	24.989	25.020	26.788	24.800
1951	25.019	24.281	26.796	24.521	23.701	24.813	25.034	26.848	24.800
1952	25.096	24.371	26.796	24.724	23.885	24.901	25.040	26.859	24.800
1953	25.147	24.383	26.796	24.785	23.964	25.006	25.048	26.881	24.800
1954	25.054	24.362	26.795	24.788	23.996	24.913	25.012	26.865	24.800
1955	25.201	24.373	26.794	24.821	24.056	24.982	25.000	26.907	24.800
1956	25.117	24.195	26.792	24.664	23.943	24.843	25.000	26.886	24.800
1957	25.213	24.238	26.792	24.707	23.980	24.905	25.001	26.914	24.800
1958	24.983	24.287	26.794	24.606	23.897	24.716	25.005	26.931	24.800
1959	24.910	24.224	26.790	24.609	23.924	24.719	25.003	26.927	24.800
1960	24.906	24.226	26.791	24.609	23.927	24.713	25.003	26.939	24.800
1961	24.849	24.248	26.792	24.580	23.904	24.653	25.002	26.937	24.800
1962	24.828	24.173	26.788	24.562	23.911	24.627	25.013	26.928	24.800
1963	24.831	24.033	26.784	24.509	23.897	24.588	25.007	26.894	24.800
1964	24.840	24.037	26.785	24.477	23.864	24.602	25.000	26.949	24.800
1965	24.775	24.028	26.787	24.385	23.780	24.537	25.000	26.973	24.800
1966	24.629	23.915	26.786	24.226	23.648	24.396	25.000	26.976	24.800
1967	24.475	23.685	26.781	24.040	23.506	24.243	25.000	26.981	24.800
1968	24.445	23.621	26.780	24.014	23.486	24.186	25.000	26.984	24.800
1969	24.280	23.474	26.779	23.724	23.240	23.976	25.000	26.982	24.800
1970	23.842	23.203	26.784	22.983	22.573	23.440	25.000	26.982	24.800
1971	23.507	23.090	26.784	22.670	22.301	23.124	25.000	26.981	24.800
1972	23.389	22.998	26.782	22.550	22.204	23.036	25.000	26.979	24.800
1973	23.376	22.831	26.780	22.586	22.246	23.057	25.000	26.596	24.800
1974	23.072	22.479	26.778	22.419	21.781	22.677	25.000	26.700	24.800
1975	22.897	22.261	26.782	22.436	21.642	22.506	25.000	26.562	24.800
1976	22.855	22.774	26.781	22.530	21.679	22.498	25.000	26.601	24.800
1977	22.597	22.919	26.787	22.322	21.508	22.265	25.000	26.548	24.800
1978	22.248	22.466	26.789	22.207	21.275	22.017	25.000	26.478	24.800
1979	22.454	22.242	26.788	22.452	21.364	22.100	25.000	26.548	24.800
1980	22.415	22.543	26.790	22.690	21.295	21.947	25.000	26.384	24.800
1981	22.308	22.474	26.794	22.585	21.085	21.713	25.000	26.160	24.800
1982	22.239	22.695	26.797	22.712	21.194	21.674	25.000	26.223	24.800
1983	22.052	22.775	26.798	22.691	21.133	21.576	25.000	26.291	24.800
1984	22.010	22.844	26.799	22.543	21.101	21.573	25.000	26.402	24.800
1985	21.870	22.646	26.798	22.020	20.959	21.366	25.000	26.307	24.800
1986	21.913	22.947	26.798	22.198	21.084	21.462	25.000	26.292	24.800
1987	21.922	23.404	26.792	22.381	21.136	21.517	25.000	26.291	24.800
1988[2]	21.832	23.089	26.788	22.367	20.923	21.340	25.000	26.316	24.800

[1] Includes transportation.

[2] Preliminary.

Source: See "Thermal Conversion Factor Source Documentation," which follows Table A7.

Table A6. Approximate Heat Content of Coal by Type, 1949-1988

(Million Btu per Short Ton)

	Bituminous Coal [1] and Lignite								Anthracite				
		Consumption								Consumption			
Year	Production	Residential and Commercial	Coke Plants	Other Industry [2]	Electric Utilities	Total	Imports	Exports	Production	Non-Electric Utility Users	Electric Utilities	Total	Imports and Exports
1949	24.965	24.044	26.800	24.601	24.022	24.836	25.000	27.000	24.421	24.954	17.500	24.291	25.400
1950	25.126	24.162	26.800	24.804	24.200	25.024	25.000	27.000	24.667	25.297	17.500	24.592	25.400
1951	25.065	23.988	26.800	24.503	23.936	24.854	25.000	27.000	24.439	25.082	17.500	24.289	25.400
1952	25.157	24.108	26.800	24.711	24.118	24.955	25.000	27.000	24.400	25.063	17.500	24.257	25.400
1953	25.207	24.143	26.800	24.773	24.172	25.062	25.000	27.000	24.264	25.132	17.500	24.147	25.400
1954	25.115	24.144	26.800	24.775	24.174	24.971	25.000	27.000	24.234	25.015	17.500	24.130	25.400
1955	25.258	24.166	26.800	24.811	24.206	25.034	25.000	27.000	24.194	25.084	17.500	24.053	25.400
1956	25.187	24.082	26.800	24.668	24.080	24.913	25.000	27.000	23.899	24.548	17.500	23.580	25.400
1957	25.286	24.108	26.800	24.711	24.118	24.979	25.000	27.000	23.785	24.587	17.500	23.441	25.400
1958	25.031	24.039	26.800	24.592	24.014	24.758	25.000	27.000	24.059	25.003	17.500	23.903	25.400
1959	24.965	24.047	26.800	24.606	24.026	24.773	25.000	27.000	23.817	24.666	17.500	23.664	25.400
1960	24.960	24.054	26.800	24.604	24.029	24.765	25.000	27.000	23.717	24.721	17.500	23.592	25.400
1961	24.892	24.034	26.800	24.569	23.993	24.693	25.000	27.000	23.854	24.870	17.500	23.707	25.400
1962	24.869	24.027	26.800	24.558	23.988	24.668	25.000	27.000	23.811	24.666	17.500	23.515	25.400
1963	24.879	24.007	26.800	24.524	23.962	24.639	25.000	27.000	23.633	24.110	17.500	23.107	25.400
1964	24.887	23.988	26.800	24.490	23.928	24.652	25.000	27.000	23.507	24.164	17.500	23.128	25.400
1965	24.813	23.928	26.800	24.387	23.836	24.575	25.000	27.000	23.471	24.316	17.500	23.175	25.400
1966	24.664	23.836	26.800	24.227	23.699	24.431	25.000	27.000	23.202	24.193	17.500	22.906	25.400
1967	24.516	23.737	26.800	24.056	23.554	24.287	25.000	27.000	22.655	23.506	17.500	22.291	25.400
1968	24.487	23.724	26.800	24.034	23.531	24.229	25.000	27.000	22.425	23.293	17.500	22.037	25.400
1969	24.313	23.553	26.800	23.737	23.274	24.011	25.000	27.000	22.543	23.200	17.500	22.003	25.400
1970	23.862	23.111	26.800	22.973	22.603	23.461	25.000	27.000	22.603	23.476	17.500	22.102	25.400
1971	23.519	22.927	26.800	22.653	22.325	23.138	25.000	27.000	22.718	23.572	17.500	22.210	25.400
1972	23.400	22.861	26.800	22.539	22.225	23.050	25.000	27.000	22.422	23.403	17.500	21.822	25.400
1973	23.391	22.887	26.800	22.585	22.262	23.073	25.000	26.612	22.132	22.674	17.920	21.464	25.400
1974	23.087	22.523	26.800	22.420	21.799	22.694	25.000	26.716	21.711	22.330	17.200	20.919	25.400
1975	22.910	22.258	26.800	22.439	21.659	22.522	25.000	26.573	21.582	22.272	17.064	20.762	25.400
1976	22.863	22.819	26.800	22.528	21.692	22.509	25.000	26.613	22.045	22.618	17.526	21.254	25.400
1977	22.597	22.594	26.800	22.290	21.521	22.266	25.000	26.561	22.661	24.101	17.244	22.066	25.400
1978	22.242	22.078	26.800	22.175	21.284	22.014	25.000	26.501	23.079	24.388	17.104	22.398	25.400
1979	22.449	21.884	26.800	22.436	21.372	22.100	25.000	26.570	23.170	24.272	17.454	22.069	25.400
1980	22.411	22.488	26.800	22.690	21.301	21.950	25.000	26.404	22.869	22.719	17.652	21.405	25.400
1981	22.301	22.010	26.800	22.572	21.091	21.710	25.000	26.176	23.291	23.749	18.168	22.080	25.400
1982	22.233	22.226	26.800	22.695	21.200	21.670	25.000	26.251	23.289	24.578	18.160	22.518	25.400
1983	22.048	22.438	26.800	22.680	21.141	21.576	25.000	26.300	22.734	24.536	16.516	21.583	25.400
1984	22.005	22.406	26.800	22.525	21.108	21.570	25.000	26.410	23.107	25.128	17.018	22.322	25.400
1985	21.867	22.568	26.800	22.013	20.965	21.368	25.000	26.320	22.428	23.031	16.784	20.817	25.400
1986	21.908	22.669	26.800	22.185	21.091	21.462	25.000	26.308	23.084	24.399	15.578	21.512	25.400
1987	21.918	22.800	26.800	22.360	21.143	21.514	25.000	26.304	23.108	26.293	15.962	22.435	25.400
1988[3]	21.828	22.690	26.800	22.344	20.929	21.337	25.000	26.316	23.108	25.721	17.428	22.473	25.400

[1] Including subbituminous coal.
[2] Includes transportation.
[3] Preliminary.
Source: See "Thermal Conversion Factor Source Documentation," which follows Table A7.

Table A7. Approximate Heat Rates for Electricity, 1949-1988

(Btu per Kilowatthour)

Year	By Type of Generation			Electricity Consumption
	Fossil Fuel Steam-Electric Power Plant Generation [1]	Nuclear Power Plant Generation	Geothermal Energy Power Plant Generation	
1949	15,033	—	—	3,412
1950	14,030	—	—	3,412
1951	13,641	—	—	3,412
1952	13,361	—	—	3,412
1953	12,889	—	—	3,412
1954	12,180	—	—	3,412
1955	11,699	—	—	3,412
1956	11,456	—	—	3,412
1957	11,365	11,629	—	3,412
1958	11,085	11,629	—	3,412
1959	10,970	11,629	—	3,412
1960	10,760	11,629	23,200	3,412
1961	10,650	11,629	23,200	3,412
1962	10,558	11,629	23,200	3,412
1963	10,482	11,877	22,182	3,412
1964	10,462	11,912	22,182	3,412
1965	10,453	11,804	22,182	3,412
1966	10,415	11,623	22,182	3,412
1967	10,432	11,555	21,770	3,412
1968	10,398	11,297	21,606	3,412
1969	10,447	11,037	21,606	3,412
1970	10,494	10,977	21,606	3,412
1971	10,478	10,837	21,655	3,412
1972	10,379	10,792	21,668	3,412
1973	10,389	10,903	21,674	3,412
1974	10,442	11,161	21,674	3,412
1975	10,406	11,013	21,611	3,412
1976	10,373	11,047	21,611	3,412
1977	10,435	10,769	21,611	3,412
1978	10,361	10,941	21,611	3,412
1979	10,353	10,879	21,545	3,412
1980	10,388	10,908	21,639	3,412
1981	10,453	11,030	21,639	3,412
1982	10,454	11,073	21,629	3,412
1983	10,520	10,905	21,290	3,412
1984	10,323	10,843	21,303	3,412
1985	10,339	10,813	21,265	3,412
1986	10,261	10,799	21,263	3,412
1987	10,253	10,776	21,263	3,412
1988[2]	10,253	10,776	21,263	3,412

[1] This is used as the thermal conversion factor for hydroelectric power generation and for wood and waste, wind, photovoltaic, and solar thermal energy consumed at electric utilities.

[2] Preliminary.

— = Not applicable.

Source: See "Thermal Conversion Factor Source Documentation," which follows this table.

Thermal Conversion Factor Source Documentation

Petroleum and Natural Gas Plant Liquids

Asphalt. • 1949 forward: Energy Information Administration (EIA) adopted the thermal conversion factor of 6.636 million British thermal units (Btu) per barrel as estimated by the Bureau of Mines and first published in the *Petroleum Statement, Annual, 1956.*

Aviation Gasoline. • 1965 forward: EIA adopted the thermal conversion factor of 5.048 million Btu per barrel as adopted by the Bureau of Mines from the Texas Eastern Transmission Corporation publication *Competition and Growth in American Energy Markets 1947–1985,* 1968.

Butane. • 1949 forward: EIA adopted the Bureau of Mines thermal conversion factor of 4.326 million Btu per barrel as published in the *California Oil World and Petroleum Industry,* First Issue, April 1942.

Butane–Propane Mixture. • 1949–1983: EIA adopted the Bureau of Mines calculation of 4.130 million Btu per barrel based on an assumed mixture of 60 percent butane and 40 percent propane. See "Butane" and "Propane." EIA use of this term ceased in 1983.

Crude Oil, Exports. • 1949 forward: Assumed by EIA to be 5.800 million Btu per barrel or equal to the thermal conversion factor for crude oil produced in the United States. See "Crude Oil and Lease Condensate, Production."

Crude Oil, Imports. • 1949 forward: Calculated annually by EIA by weighting the thermal conversion factor of each type of crude oil imported by the quantity imported. Thermal conversion factors for each type were calculated on a foreign country basis, by determining the average American Petroleum Institute (API) gravity of crude imported from each foreign country from Form ERA-60 in 1977 and converting average API gravity to average Btu content using National Bureau of Standards, Miscellaneous Publication No. 97, *Thermal Properties of Petroleum Products,* 1933.

Crude Oil and Lease Condensate, Production. • 1949 forward: EIA adopted the thermal conversion factor of 5.800 million Btu per barrel as reported in a Bureau of Mines internal memorandum *Bureau of Mines Standard Average Heating Values of Various Fuels, adopted January 3, 1950.*

Crude Oil and Petroleum Products, Exports. • 1949 forward: Calculated annually by EIA as the average of the thermal conversion factors for each petroleum product exported and crude oil exported weighted by the quantity of each petroleum product and crude oil exported. See "Petroleum Products, Exports" and "Crude Oil, Exports."

Crude Oil and Petroleum Products, Imports. • 1949 forward: Calculated annually by EIA as the average of the thermal conversion factors for each petroleum product and each crude oil imported weighted by the quantity of each petroleum product and each type of crude oil imported. See "Crude Oil, Imports" and "Petroleum Products, Imports."

Distillate Fuel Oil. • 1949 forward: EIA adopted the Bureau of Mines thermal conversion factor of 5.825 million Btu per barrel as reported in a Bureau of Mines internal memorandum, *Bureau of Mines Standard Average Heating Value of Various Fuels, adopted January 3, 1950.*

Ethane. • 1959 forward: EIA adopted the Bureau of Mines thermal conversion factor of 3.082 million Btu per barrel as published in the *California Oil World and Petroleum Industry,* First Issue, April 1942.

Ethane–Propane Mixture. • 1979–1983: EIA calculation of 3.308 million Btu per barrel based on an assumed mixture of 70 percent ethane and 30 percent propane. See "Ethane" and "Propane." EIA use of this term ceased in 1983.

Isobutane. • 1949 forward: EIA adopted the Bureau of Mines thermal conversion factor of 3.974 million Btu per barrel as published in the *California Oil World and Petroleum Industry,* First Issue, April 1942.

Jet Fuel, Kerosene Type. • 1952 forward: EIA adopted the Bureau of Mines thermal conversion factor of 5.670 million Btu per barrel as published for "Jet Fuel, Commercial" by the Texas Eastern Transmission Corporation in the report *Competition and Growth in American Energy Markets 1947–1985,* 1968.

Jet Fuel, Naphtha Type. • 1952 forward: EIA adopted the Bureau of Mines thermal conversion factor of 5.355 million Btu per barrel as published for "Jet Fuel, Military" by the Texas Eastern Transmission Corporation in the report *Competition and Growth in American Energy Markets 1947–1985*, 1968.

Kerosene. • 1949 forward: EIA adopted the Bureau of Mines thermal conversion factor of 5.670 million Btu per barrel as reported in a Bureau of Mines internal memorandum, *Bureau of Mines Standard Average Heating Values of Various Fuels, adopted January 3, 1950.*

Lubricants. • 1949 forward: EIA adopted the thermal conversion factor of 6.065 million Btu per barrel as estimated by the Bureau of Mines and first published in the *Petroleum Statement, Annual, 1956.*

Miscellaneous Products. • 1949 forward: EIA adopted the thermal conversion factor of 5.796 million Btu per barrel as estimated by the Bureau of Mines and first published in the *Petroleum Statement, Annual, 1956.*

Motor Gasoline. • 1949 forward: EIA adopted the Bureau of Mines thermal conversion factor of 5.253 million Btu per barrel as published for "Gasoline, Motor Fuel" by the Texas Eastern Transmission Corporation in the report *Competition and Growth in American Energy Markets 1947–1985*, 1968.

Natural Gasoline. • 1949–1983: EIA adopted the thermal conversion factor of 4.620 million Btu per barrel as estimated by the Bureau of Mines and first published in the *Petroleum Statement, Annual, 1956.* EIA use of this term ceased in 1983.

Natural Gas Plant Liquids, Production. • 1949 forward: Calculated annually by EIA as the average of the thermal conversion factors of each natural gas plant liquid produced weighted by the quantity of each natural gas plant liquid produced.

Pentanes Plus. • 1984 forward: EIA assumed the thermal conversion factor to be 4.620 million Btu or equal to that for natural gasoline. See "Natural Gasoline."

Petrochemical Feedstocks, Naphtha 400 degrees F or Less. • 1962 forward: Assumed by EIA to be 5.248 million Btu per barrel, equal to the thermal conversion factor for special naphtha. See "Special Naphtha."

Petrochemical Feedstock, Over 400 degrees F. • 1962 forward: Assumed by EIA to be 5.825 million Btu per barrel, equal to the thermal conversion factor for distillate fuel oil. See "Distillate Fuel Oil."

Petrochemical Feedstock, Still Gas. • 1962 forward: Assumed by EIA to be 6.000 million Btu per barrel, equal to the thermal conversion factor for still gas. See "Still Gas."

Petroleum Coke. • 1949 forward: EIA adopted the thermal conversion factor of 6.024 million Btu per barrel as reported in Btu per short ton in the Bureau of Mines internal memorandum *Bureau of Mines Standard Average Heating Value of Various Fuels, adopted January 3, 1950.* Bureau of Mines calculated this factor by dividing the 30,120,000 Btu per short ton as given in the referenced Bureau of Mines internal memorandum by 5.0 barrels per short ton as given in the Bureau of Mines Form 6-1300-M and successor EIA forms.

Petroleum Products, Consumption. • 1949 forward: Calculated annually by EIA as the average of the thermal conversion factors for all petroleum products consumed, weighted by the quantity of each petroleum product consumed.

Petroleum Products, Consumption by Electric Utilities. • 1949–1959: Calculated annually by EIA as the average of the thermal conversion factors for all petroleum products consumed at electric utilities, weighted by the quantity of each petroleum product consumed at electric utilities. • 1960–1987: Calculated from the State Energy Data System as documented in the *State Energy Data Report, Consumption Estimates, 1960–1987.* • 1988: Estimated by EIA.

Petroleum Products, Consumption by Industrial Users. • 1949–1959: Calculated annually by EIA as the average of the thermal conversion factors for all petroleum products consumed in the industrial sector, weighted by the estimated quantity of each petroleum product consumed in the industrial sector. • 1960–1987: Calculated from the State Energy Data System as documented in the *State Energy Data Report, Consumption Estimates, 1960–1987.* • 1988: Estimated by EIA.

Petroleum Products, Consumption by Residential and Commercial Users. • 1949–1959: Calculated annually by EIA as the average of the thermal conversion factors for all petroleum products consumed by the residential and commercial sector, weighted by the estimated quantity of each petroleum product consumed in the residential and commercial sector. • 1960–1987: Calculated from the State Energy Data System as documented in the *State Energy Data Report, Consumption Estimates, 1960–1987.* • 1988: Estimated by EIA.

Petroleum Products, Consumption by Transportation Users. • 1949–1959: Calculated annually by EIA as the average of the thermal conversion factor for all petroleum products consumed in the transportation sector, weighted by the estimated quantity of each petroleum product consumed in the transportation sector. • 1960–1987: Calculated from the State Energy Data System as documented in the *State Energy Data Report, Consumption Estimates, 1960–1987.* • 1988: Estimated by EIA.

Petroleum Products, Exports. • 1949 forward: Calculated annually by EIA as the average of the thermal conversion factors for each petroleum product weighted by the quantity of each petroleum product exported.

Petroleum Products, Imports. • 1949 forward: Calculated annually by EIA as the average of the thermal conversion factors for each petroleum product imported weighted by the quantity of each petroleum product imported.

Plant Condensate. • 1949–1983: Estimated to be 5.418 million Btu per barrel by EIA from data provided by McClanahan Consultants, Inc., Houston, Texas. EIA use of this term ceased in 1983.

Propane. • 1949 forward: EIA adopted the Bureau of Mines thermal conversion factor of 3.836 million Btu per barrel as published in the *California Oil World and Petroleum Industry*, First Issue, April 1942.

Residual Fuel Oil. • 1949 forward: EIA adopted the thermal conversion factor of 6.287 million Btu per barrel as reported in the Bureau of Mines internal memorandum *Bureau of Mines Standard Average Heating Values of Various Fuels, adopted January 3, 1950.*

Road Oil. • 1949 forward: EIA adopted the Bureau of Mines thermal conversion factor of 6.636 million Btu per barrel which was assumed to be equal to that of asphalt (see "Asphalt") and was first published by the Bureau of Mines in the *Petroleum Statement, Annual, 1970.*

Special Naphtha. • 1965 forward: EIA adopted the Bureau of Mines thermal conversion factor of 5.248 million Btu per barrel which was assumed to be equal to that of total gasoline (aviation and motor) factor and was first published in the *Petroleum Statement, Annual, 1970.*

Still Gas. • 1949 forward: EIA adopted the Bureau of Mines estimated thermal conversion factor of 6.000 million Btu per barrel and was first published in the *Petroleum Statement, Annual, 1970.*

Unfinished Oil. • 1949 forward: EIA assumed the thermal conversion factor to be 5.825 million Btu per barrel or equal to that for distillate fuel oil (see "Distillate Fuel Oil") and first published in the *Annual Report to Congress, Volume 3, 1977.*

Unfractionated Stream. • 1979–1983: EIA assumed the thermal conversion factor to be 5.418 million Btu per barrel or equal to that for plant condensate (see "Plant Condensate") and first published in the *Annual Report to Congress, Volume 2, 1981.* EIA use of this term ceased in 1983.

Wax. • 1949 forward: EIA adopted the thermal conversion factor of 5.537 million Btu per barrel as estimated by the Bureau of Mines and first published in the *Petroleum Statement, Annual, 1956.*

Natural Gas

Natural Gas, Consumption. • 1949–1962: EIA adopted the thermal conversion factor of 1,035 Btu per cubic foot as estimated by the Bureau of Mines and first published in the *Petroleum Statement, Annual, 1956.* • 1963–1979: EIA adopted the thermal conversion factor calculated annually by the American Gas Association (AGA) and published in *Gas Facts,* an AGA annual. • 1980–1987: Calculated annually by EIA by dividing the total heat content of natural gas consumed by the total quantity of natural gas consumed. Heat content and quantity consumed are from Form EIA-176. • 1988: Estimated to be the same as 1987.

Natural Gas, Consumption by Electric Utilities. • 1949–1972: Assumed by EIA to be equal to the thermal conversion factor for the consumption of dry natural gas. See "Natural Gas, Consumption." • 1973–1987: calculated annually by EIA by dividing the total heat content of natural gas received at electric utilities by the total quantity received at electric utilities. The heat contents and receipts are from FERC Form 423 and predecessor forms. • 1988: Estimated to be the same as 1987.

Natural Gas, Consumption by Non-Electric Utility Users. • 1949–1972: Assumed by EIA to be equal to the thermal conversion factor for the consumption of dry natural gas. See "Natural Gas, Consumption." • 1973–1987: Calculated annually by EIA by subtracting the heat content of natural gas consumed at electric utilities from the heat content of total natural gas consumed and dividing the result by the quantity of non-utility natural gas consumption (total consumption less electric utility consumption). • 1988: Estimated to be the same as 1987.

Natural Gas, Exports. • 1949–1972: Assumed by EIA to be equal to the thermal conversion factor for the consumption of dry natural gas. See "Natural Gas, Consumption." • 1973–1987: Calculated annually by EIA by dividing the heat content of exported natural gas by the quantity of natural gas exported, both reported on FPC Form-14. • 1988: Estimated to be the same as 1987.

Natural Gas, Imports. • 1949–1972: Assumed by EIA to be equal to the thermal conversion factor for the consumption of dry natural gas. See "Natural Gas, Consumption." • 1973–1987: Calculated annually by EIA by dividing the heat content of imported natural gas by the quantity of natural gas imported, both reported on FPC Form-14. • 1988: Estimated to be the same as 1987.

Natural Gas, Production (Dry). • 1949 forward: Assumed by EIA to be equal to the thermal conversion factor for the consumption of dry natural gas. See "Natural Gas, Consumption."

Natural Gas, Production (Wet). • 1949–1987: Calculated annually by EIA by adding the heat content of natural gas, dry production and the total heat content of natural gas plant liquids production and dividing this sum by the total quantity of marketed (wet) natural gas production. • 1988: Estimated to be the same as 1987.

Coal and Coal Coke

All Coal, Consumption. • 1949 forward: Calculated annually by EIA by dividing the sum of the heat content of bituminous coal and lignite and anthracite consumption by the sum of their respective tonnages.

All Coal, Consumption by Electric Utilities Only. • 1949 forward: Calculated annually by EIA by dividing the sum of the heat content of bituminous coal and lignite and anthracite received at electric utilities by the sum of their respective tonnages received.

All Coal, Consumption by Non-Electric Utility Users. • 1949 forward: Calculated annually by EIA by dividing the sum of the heat content of bituminous coal and lignite and anthracite consumed by nonelectric utility users by the sum of their respective tonnages.

All Coal, Exports. • 1949 forward: Calculated annually by EIA by dividing the sum of the heat content of bituminous coal and lignite and anthracite exported by the sum of their respective tonnages.

All Coal, Imports. • 1949 forward: Calculated annually by EIA by dividing the sum of the heat content of bituminous coal and lignite and anthracite imported by the sum of their respective tonnages.

All Coal, Production. • 1949 forward: Calculated annually by EIA by dividing the sum of the total heat content of bituminous coal and lignite and anthracite production by the sum of their respective tonnages.

Anthracite, Consumption. • 1949 forward: Calculated annually by EIA by dividing the sum of the heat content of anthracite consumed by electric utilities and non-electric utilities by the total quantity of anthracite consumed.

Anthracite, Consumption by Electric Utilities. • 1949–1972: Assumed by EIA that all anthracite consumed at electric utilities was recovered from culm banks and river dredging and estimated to have an average heat content of 17.500 million Btu per short ton. • 1973 forward: Calculated annually by EIA by dividing the heat content of anthracite receipts at electric utilities by the quantity of anthracite received at electric utilities, as reported on FERC Form 423 and predecessor forms.

Anthracite, Consumption by Non-Electric Utility Users. • 1949 forward: Calculated annually by EIA by dividing the heat content of anthracite production less the heat content of the anthracite consumed at electric utilities, net exports, and shipments to U.S. Armed Forces overseas by the quantity of non-electric utility anthracite consumption less the quantity of anthracite stock changes, losses, and unaccounted for.

Anthracite, Imports and Exports. • 1949 forward: EIA assumed the anthracite imports and exports to be freshly mined anthracite having an estimated heat content of 25.400 million Btu per short ton.

Anthracite, Production. • 1949 forward: Calculated annually by EIA by dividing the sum of the heat content of freshly mined anthracite (estimated to have an average heat content of 25.400 million Btu per short ton) and the heat content of anthracite recovered from culm banks and river dredging (estimated to have an average heat content of 17.500 million Btu per short ton) by the total quantity of anthracite production.

Bituminous Coal and Lignite, Consumption. • 1949 forward: Calculated annually by EIA by dividing the sum of the heat content of bituminous coal and lignite consumed by electric utilities, coal coke plants, other industrial plants, and by the residential and commercial sector and the transportation sector by the sum of their respective tonnages.

Bituminous Coal and Lignite, Consumption by Coke Plants: • 1949 forward: Estimated by EIA to be 26.800 million Btu per short ton based on input-output analysis of coal carbonization.

Bituminous Coal and Lignite, Consumption by Electric Utilities. • 1949–1972: EIA adopted the average thermal conversion factor of the Bureau of Mines which used the National Coal Association average thermal conversion factor for electric utilities calculated from FPC Form-1 and published in *Steam Electric Plant Factors*, a National Coal Association annual report. • 1973 forward: Calculated annually by EIA by dividing the total heat content of bituminous coal and lignite received at electric utilities by the total quantity received at electric utilities. Heat contents and receipts are from FERC Form 423 and predecessor forms.

Bituminous Coal and Lignite, Consumption by Other Industrial Users. • 1949–1973: Calculated annually by EIA through regression analysis measuring the difference between the average Btu value of coal consumed by other industrial users and that of coal consumed at electric utilities in the 1974–1983 period. • 1974 forward: Calculated annually by EIA by assuming that the bituminous coal and lignite delivered to other industrial users from each coal-producing district (reported on EIA Form 6 and predecessor Bureau of Mines Form 6–1419–Q) contained a heat value equal to bituminous coal and lignite received at electric utilities from each of the same coal-producing districts (reported on FERC Form 423). The average Btu value of coal by coal-producing district was applied to the volume of deliveries to other industrial users from each coal-producing district, and the sum total of the heat content was divided by the total volume of deliveries.

Bituminous Coal and Lignite, Consumption by Residential and Commercial Users. • 1949–1973: Calculated annually by EIA through regression analysis measuring the difference between the average Btu value of coal consumed by residential and commercial users and that of coal consumed by electric utilities in the 1974–1983 period. • 1974 forward: Calculated annually by EIA by assuming that the bituminous coal and lignite delivered to residential and commercial users from each coal-producing district (reported on EIA Form 6 and predecessor Bureau of Mines Form 6–1419–Q) contained a heat value equal to bituminous coal and lignite received at electric utilities from each of the same coal-producing districts (reported on FERC Form 423). The average Btu value of coal by coal-producing district was applied to the volume of deliveries to residential and commercial users from each coal-producing district, and the sum total of the heat value was divided by the total volume of deliveries.

Bituminous Coal and Lignite, Consumption by Transportation Users: • 1949 forward: Assumed by EIA to be equal to the Btu conversion factor for "Bituminous Coal and Lignite, Consumption by Other Industrial Users."

Bituminous Coal and Lignite, Exports. • 1949–1972: Assumed by EIA to be all metallurgical coal and to have an average thermal content of 27.000 million Btu per short ton. • 1973 forward: Calculated annually by EIA by dividing the sum of the heat content of exported metallurgical coal (estimated to average 27.000 million Btu per short ton) and the heat content of exported steam coal (estimated to have an average thermal content of 25.000 million Btu per short ton) by the total quantity of bituminous coal and lignite exported.

Bituminous Coal and Lignite, Imports. • 1949 forward: EIA estimated the average thermal conversion factor to be 25.000 million Btu per short ton.

Bituminous Coal and Lignite, Production. • 1949 forward: Calculated annually by EIA by dividing the sum of the heat content of bituminous coal and lignite consumption, net exports, stock changes, and unaccounted for by the sum of their respective tonnages. Consumers' stock changes by sectors were assumed to have the same conversion factor as the consumption sector. Producers' stock changes and unaccounted for were assumed to have the same conversion factor as consumption by all users.

Coal Coke, Imports and Exports. • 1949 forward: EIA adopted the Bureau of Mines estimate of 24.800 million Btu per short ton.

Electricity

Fossil Fuel Steam-Electric Power Plant Generation. There is no generally accepted practice for measuring the thermal conversion rates for power plants that generate electricity from hydroelectric, wood and waste, wind, photovoltaic, or solar thermal energy sources. EIA has selected a rate that is equal to the prevailing annual average heat rate factor for fossil-fueled steam-electric power plants in the United States. By using that factor, it is possible to evaluate fossil fuel requirements for replacing those sources during periods of interruption such as droughts. The heat content of a kilowatthour of electricity produced, regardless of the generation process, is 3,412 Btu per kilowatthour. • 1949–1955: The weighted annual average heat rate for fossil-fueled steam-electric power plants in the United States, as published by EIA in *Thermal-Electric Plant Construction Cost and Annual Production Expenses—1981* and *Steam-Electric Plant Construction Cost and Annual Production Expenses—1978*. • 1956 through 1987: The weighted annual average heat rate for fossil-fueled steam-electric power plants in the United States, as published by EIA in *Historical Plant Cost and Annual Production Expenses for Selected Electric Plants*. • 1988: Estimated to be the same as 1987.

Geothermal Energy Power Plant Generation. • 1960–1981: Calculated annually by EIA by weighting the annual average heat rates of operating geothermal units by the installed nameplate capacities as reported on FPC Form–12. • 1982 forward: Estimated annually by EIA based on an informal survey of relevant plants.

Nuclear Generating Units. • 1957–1987: Calculated annually by EIA by dividing the total heat content consumed in reactors at nuclear generating units by the total (net) electricity generated by nuclear plants as reported on FERC Form–1, EIA-412, and predecessor forms, and, beginning with 1982 data, as published in EIA, *Historical Plant Cost and Annual Production Expenses for Selected Electric Plants*. • 1988: Estimated to be the same as 1987.

Appendix B. Energy Units in Perspective

Using Appendix B

The three tables in this appendix are intended to help the nontechnical reader understand the value of the various energy units used in the *Annual Energy Review*. The values (especially the equivalents in Table B3) shown here are approximations intended to convey a general idea of the magnitude of energy units.

The tables can be used to relate a familiar measure of energy, such as gallons, to energy measures used in this report. For example, Table B1 shows that 8 gallons of motor gasoline is equal to roughly one-fifth of a barrel of crude oil.[1] Using information from Table B2, the reader can calculate that the 8 gallons of motor gasoline was, on average, a six-and-a-half-day supply per capita in 1988. Table B3 indicates that 8 gallons of motor gasoline equals about 10 therms of natural gas or approximately 1 million British thermal units (see Glossary).

[1] However, due to the nature of the refining process, one-fifth of a barrel of crude oil would yield less than 8 gallons of motor gasoline.

Table B1. Physical Conversion Factors for Energy Units

Type of Unit	Factor
Weight	2,000 pounds/short ton 1.102 short tons/metric ton 1.120 short tons/long ton
Volume	0.028 cubic meters/cubic foot 35.315 cubic feet/cubic meter 42 U.S. gallons/U.S. barrel 128 cubic feet/cord
Weight and Volume	0.136 metric tons/U.S. barrel[1] 0.150 short tons/U.S. barrel[1] 7.33 U.S. barrels/metric ton[1] 6.65 U.S. barrels/short ton[1] 1.25 short tons/cord[2]

[1] For crude oil (average gravity).
[2] For dry hardwood (average).

Table B2. U.S. Daily Per Capita Consumption of Energy by Type, 1973, 1979, and 1988

Type of Energy	1973	1979	1988	Percent Change 1973–1979	Percent Change 1979–1988
	Gallons				
Petroleum Products	3.4	3.5	2.9	0.7	-17.1
Motor Gasoline	1.3	1.3	1.2	0.0	-7.7
	Cubic Feet				
Natural Gas (dry)	286	247	201	-13.6	-18.6
	Pounds				
Coal	14.6	16.6	19.6	13.7	18.1
	Kilowatthours				
Hydroelectricity	3.5	3.4	2.5	-2.9	-26.5
Nuclear Electricity	1.1	3.1	5.9	181.8	90.3
Electricity (all)	22.0	25.0	29.0	13.6	16.0
	Thousand Btu				
Industrial Energy[1]	408	398	322	-2.5	-19.1
Total Energy	963	963	889	0.0	-7.7

[1] Includes electric losses distributed.

Table B3. Energy Equivalents

Energy Unit	Equivalent[1]	
1 Btu of Energy	1	match tip
	250	calories (International Steam Table)
	0.25	kilocalories (food calories)
1,000 Btu of Energy	2	5-ounce glasses of table wine
	250	kilocalories (food calories)
	0.80	peanut butter and jelly sandwiches
1 Million Btu of Energy	90	pounds of coal
	120	pounds of oven-dried hardwood
	8	gallons of motor gasoline—enough to move the average U.S. passenger car about 154 miles (1987)
	10	therms of dry natural gas
	11	gallons of propane
	1.2	days of U.S. energy consumption per capita (1984)
	2	months of the dietary intake of a laborer
1 Quadrillion[2] Btu of Energy	45	million short tons of coal
	60	million short tons of oven—dried hardwood
	1	trillion cubic feet of dry natural gas
	470	thousand barrels of crude oil per day for 1 year
	25	days of U.S. petroleum imports
	26	days of U.S. motor gasoline use
	27	hours of world energy use (1987)
1 Barrel of Crude Oil	14	days of U.S. petroleum consumption (1988)
	5.6	thousand cubic feet of dry natural gas
	0.26	short tons (520 pounds) of coal
	1,700	kilowatthours of electricity
1 Short Ton of Coal	106	days of U.S. coal consumption per capita (1988)
	3.8	barrels of crude oil
	21	thousand cubic feet of dry natural gas
	6,500	kilowatthours of electricity
1,000 Cubic Feet of Natural Gas	4.9	days of natural gas use per capita (1988)
	0.18	barrels (7.4 gallons) of crude oil
	0.047	short tons (93 pounds) of coal
	300	kilowatthours of electricity
1,000 Kilowatthours (kWh) of Electricity	35	days of U.S. electricity use per capita
	0.59	barrels of crude oil[3]
	0.15	short tons (310 pounds) of coal[3]
	3,300	cubic feet of dry natural gas[3]

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[1] Equivalents are approximate.

[2] One quadrillion equals 1,000,000,000,000,000.

[3] However, because of net energy losses associated with the generation of electricity, about three times as much fossil fuel is required to generate 1,000 kWh: 1.8 barrels of oil, 0.47 short tons of coal, or 10,000 cubic feet of natural gas.

Note: •One million Btu of fossil fuels burned at electric utilities can generate about 100 kilowatthours of electricity, while it takes about 300 kilowatthours of electricity generated at electric utilities to produce 1 million Btu of heat. •Calculations are based on 1988 data where applicable, unless otherwise noted.

Appendix C. GNP Dollars and Deflators

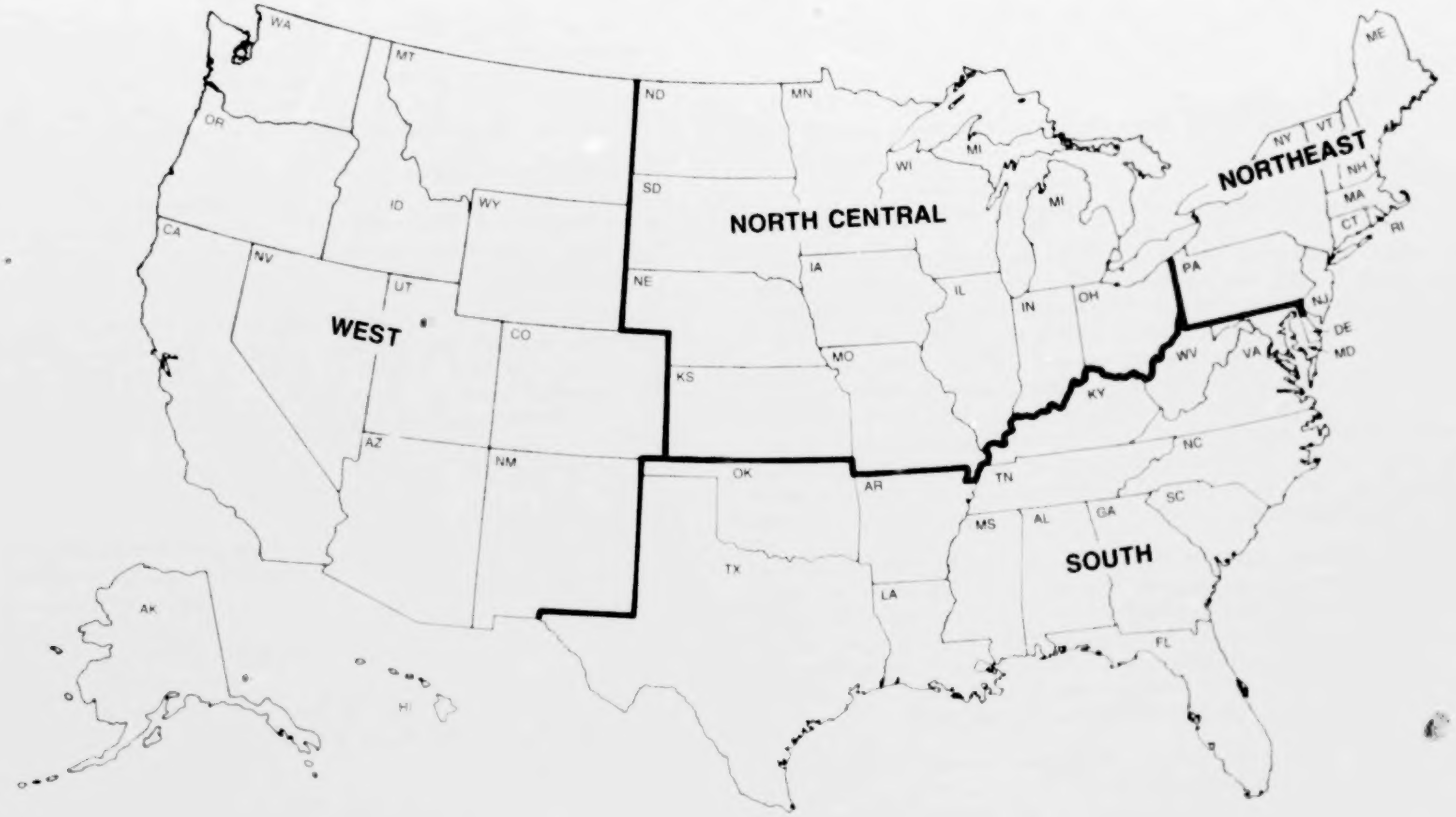
Table C1. GNP[1] Dollars and Implicit Price Deflators, 1949–1988

Years 1949–1969	GNP (billion 1982 dollars)	Deflator (1982=100)	Years 1970–1988	GNP (billion 1982 dollars)	Deflator (1982=100)
1949	1,109.0	23.5			
1950	1,203.7	23.9	1970	2,416.2	42.0
1951	1,328.2	25.1	1971	2,484.8	44.4
1952	1,380.0	25.5	1972	2,608.5	46.5
1953	1,435.3	25.9	1973	2,744.1	49.5
1954	1,416.2	26.3	1974	2,729.3	54.0
1955	1,494.9	27.2	1975	2,695.0	59.3
1956	1,525.6	28.1	1976	2,826.7	63.1
1957	1,551.1	29.1	1977	2,958.6	67.3
1958	1,539.2	29.7	1978	3,115.2	72.2
1959	1,629.1	30.4	1979	3,192.4	78.6
1960	1,665.3	30.9	1980	3,187.1	85.7
1961	1,708.7	31.2	1981	3,248.8	94.0
1962	1,799.4	31.9	1982	3,166.0	100.0
1963	1,873.3	32.4	1983	3,279.1	103.9
1964	1,973.3	32.9	1984	3,501.4	107.7
1965	2,087.6	33.8	1985	3,618.7	110.9
1966	2,208.3	35.0	1986	3,721.7	113.9
1967	2,271.4	35.9	1987	3,847.0	117.7
1968	2,365.6	37.7	1988	3,996.1	121.7
1969	2,423.3	39.8			

[1] GNP = Gross national product (see Glossary).

Sources: **GNP in 1982 Dollars:** • 1949 through 1987—*Economic Report of the President*, January 1989, Table B-2. • 1988—Bureau of Economic Analysis, *United States Department of Commerce News*, March 23, 1989, Table 3.
Implicit Price Deflators (1982 = 100): • 1949 through 1987—*Economic Report of the President*, January 1989, Table B-3. • 1988—Bureau of Economic Analysis, *United States Department of Commerce News*, March 23, 1989, Table 3.

Appendix D. U.S. Census Region Map


WEST
NORTH CENTRAL
NORTHEAST
SOUTH
WA
OR
CA
NV
ID
MT
WY
UT
CO
AZ
NM
AK
HI
ND
SD
NE
KS
MN
IA
MO
WI
IL
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OH
OK
TX
AR
LA
MS
AL
TN
KY
GA
FL
SC
NC
VA
WV
MD
DE
PA
NJ
NY
VT
NH
ME
MA
CT
RI

Source: Department of Commerce, Bureau of the Census.

Appendix E. Explanatory Notes

1. Electricity Generation. Data on the generation of electricity in the United States represents gross electricity output measured at the generator terminals, minus power plant use (net electricity generated). Nuclear electricity generation data identified by individual countries in this report are gross electricity output. See Tables 2, 84, 85, 86, 114, and 115.

2. Consumption of Primary Energy by End-Use Sector. Sector data are derived from the end-use sector table of each energy commodity. The "Other" sector in the Electric Utility Sales table is allocated to the Residential and Commercial Sector, except for the railways' portion of "Other," which is allocated to the Transportation Sector. See Table 4.

3. Financial Reporting System (FRS) Companies. The FRS data system is designed to permit review of the financial performance of energy companies. Data are disaggregated both by line of business and by geographic area of operation. Domestic operations include Puerto Rico and the Virgin Islands; foreign operations exclude those areas.

The 22 companies included in the FRS for the 1987 reporting year are the following:

Amerada Hess Corporation
American Petrofina Incorporated
Amoco Corporation
Ashland Oil Inc.
Atlantic Richfield Company
BP America Inc.
Burlington Northern Inc.
Chevron Corporation (formerly Standard Oil Company of California)
Coastal Corporation
E.I. du Pont de Nemours and Company (Du Pont)
Exxon Corporation
Kerr-McGee Corporation
Mobil Corporation
Occidental Petroleum Corporation
Phillips Petroleum Company
Shell Oil Company
Sun Company
Tenneco Inc.
Texaco Inc.
Unocal Corporation (formerly Union Oil Company of California)
Union Pacific Corporation
USX Corporation (formerly United States Steel Corporation)

Prior to 1983, the reporting group included 26 companies. Conoco and Marathon were replaced by Du Pont and the United States Steel Corporation, due to the merger of the former companies with the latter companies, respectively, beginning in 1982. Although Occidental acquired Cities Service in 1982, separate financial reports were available for 1982, so each company continued to be treated as a separate FRS company until 1983. In 1984 three more intragroup mergers occurred: (1) Chevron acquired Gulf Oil, (2) Mobil acquired Superior Oil, and (3) Texaco acquired Getty Oil. Since financial reports for 1984 were available for the three acquired companies, they are treated as separate companies through 1984. See Tables 34 through 37 and 43.

4. Well Completions. For the years 1970 forward, annual well completions are estimated by the Energy Information Administration (EIA) using the American Petroleum Institute's drilling data files. For more recent years, these files are not complete, due to delays in the reporting of wells drilled. Based on statistical analysis, EIA employs an adjustment process to impute missing data to show total well completions and footages for current years. See Tables 40 and 41.

5. Reclassified. Accurate calculation of the quantity of petroleum products supplied to the domestic market is complicated by the recycling of products at the refinery, the renaming of products involved in a transfer, and the receipt of products from outside of the primary supply system. Beginning in 1981, a single adjustment (always a negative quantity) is made to total product supplied to correct this accounting problem. The calculation of this adjustment, called "reclassified," involves only unfinished oils and gasoline blending components. It is the sum of their net changes in primary stocks (net withdrawals is a plus quantity, net additions is a minus quantity) plus imports minus net input to refineries. See Tables 55, 58, and 60.

6. Gross Input to Distillation Units (GIDU). The methods for deriving GIDU in this report are as follows: 1949 through 1966 GIDU is estimated by summing annual crude oil runs to stills, net unfinished oil reruns at refineries and shipments of natural gasoline and plant condensate from natural gas processing plants to refineries. 1967 through 1973 GIDU is estimated by summing annual crude oil runs to stills, net unfinished oil reruns, and refinery input of natural gasoline and plant condensate. 1974 through 1980 GIDU is published annual data. 1981 and forward GIDU is the sum of reported monthly data. See Table 56.

7. Petroleum Products Supplied. Total petroleum products supplied is the sum of the product supplied for each petroleum product, crude oil, unfinished oils, and gasoline blending components. For each of these, except crude oil, product supplied is calculated by adding refinery production, natural gas plant liquids production, new supply of other liquids, imports, stock withdrawals, and subtracting stock additions, refinery inputs, and exports. Crude oil product supplied is the sum of crude oil burned on leases and at pipeline pump stations as reported on Form EIA-813. Prior to 1983, crude oil burned on leases and at pipeline pump stations was reported as either distillate or residual fuel oil and was included as product supplied for these products. Petroleum product supplied is an approximation of petroleum consumption and is synonymous with the term "Petroleum Consumption" in Section 1. End-use sector data for petroleum products used in more than one sector are derived from surveys of sales to ultimate consumers by refiners, marketers, distributors, and dealers and from receipts at electric utilities. See Explanatory Notes 5 and 8 and Tables 58, 59, and 60.

8. Joint Petroleum Reporting System. Beginning in January 1981, several Energy Information Administration survey forms and calculation methodologies were changed to reflect new developments in refinery and blending plant practices and to improve data integrity. These changes affect production and product supplied statistics for motor gasoline, distillate fuel oil, and residual fuel oil, and stocks of motor gasoline. On the new basis, motor gasoline production during the last half of 1980 would have averaged 289,000 barrels per day higher than that which was published on the old basis. Distillate and residual fuel oil production and product supplied for all of 1980 would have averaged, respectively, 105,000 and 54,000 barrels per day higher than the numbers that were published. See Tables 55, 58, and 60.

9. Crude Oil Wellhead Prices. Derived as follows: 1949 through 1973—weighted average wellhead values as reported by State agencies and calculated by the Bureau of Mines; 1974 and 1975—weighted averages of a sample survey of major first purchasers' purchases; 1976 and forward—weighted averages of all first purchasers' purchases. See Table 63.

10. Refiner Acquisition Cost of Crude Oil. This cost was estimated for 1968 through 1973. The cost of domestic crude oil was derived by adding estimated transportation costs to the reported average wellhead value. The cost of imported crude oils was derived by adding an estimated ocean transport cost based on the published "Average Freight Rate Assessment" to the average "Free Alongside Ship" value published by the U.S. Bureau of the Census. The composite cost was derived by weighting domestic costs and imported costs based on quantities produced and imported. See Tables 65 and 117.

11. Natural Gas Consumption. Natural gas consumption statistics are compiled from a survey of natural gas production, transmission, and distribution companies and electric utility companies. Consumption by end-use sector from these surveys is compiled on a national and individual State basis and then balanced with national and individual State supply data. Included in end-use data are the following: Commercial Sector—consumption by nonmanufacturing establishments, by municipalities for institutional heating and lighting, and those engaged in agriculture, forestry, and fishing; Electric Utility Sector—consumption by electric utilities for the generation of electric power; Industrial Sector—consumption by establishments engaged primarily in processing unfinished materials into another form of product (includes mining, petroleum refining, manufacturing, and natural gas industry use for lease and plant fuel); Residential Sector—consumption by private households for space heating, cooking, and other household uses; Transportation Sector—natural gas transmission (pipeline) fuel. See Tables 72 and 75.

12. Natural Gas Prices by National Gas Policy Act of 1978 (NGPA) Categories. Old Gas. Includes natural gas dedicated to interstate commerce and natural gas purchased under existing interstate or rollover contracts (Section NGPA 104, 105, and 106). **New Gas.** Includes new natural gas and certain natural gas produced from the Outer Continental Shelf, stripper well gas, and other new gas categories (Section NGPA 102, 103, 108, and 109). **High-Cost Gas.** Includes natural gas from deep wells and low permeability (tight) reservoirs and unregulated gas (NGPA Section 107). See Table 74.

13. Coal Consumption. Data in this report on the consumption of bituminous coal (including subbituminous coal), lignite, and anthracite are generated primarily from consumption data reported in surveys. Included are data reported by all electric utility companies and coke plant companies. Data on coal consumption by all industrial and manufacturing establishments and by the residential and commercial sector are based on distribution data obtained quarterly from coal companies. Included in end-use sector data are the following: Electric Utility Sector—consumption by privately and publicly owned establishments engaged in the generation and/or distribution of electric power primarily for sale or resale; Industrial and Miscellaneous Sector—consumption at manufacturing plants, large commercial establishments, coking plants, and by agriculture, mining (other than coal mining) and construction industries; Transportation Sector—sales to railroads and vessel bunker fuel; Residential and Commercial Sector—retail dealer sales to households and small commercial establishments. See Table 78.

14. Electricity Statistics. Prior to 1985, electricity supply and distribution statistics included data reported by institutions (such as universities) and military facilities that generated electricity primarily for their own use. Beginning in 1985, electricity statistics exclude data for these facilities and include only data for those organizations that generate electricity primarily for public use. See Tables 84 through 91.

15. Electrical System Energy Losses. Electrical system energy losses are calculated as the difference between total energy input at electric utilities and the total energy content of electricity sold to end-use consumers. Most of these losses occur at steam electric power plants (conventional and nuclear) in the conversion of heat energy into mechanical energy to turn electric generators. This loss is a thermodynamically necessary feature of the steam electric cycle. Part of the energy input to output losses are a result of imputing fossil energy equivalent inputs for hydroelectric and other energy sources, since there is no generally accepted practice for measuring these thermal conversion rates. In addition to conversion losses, other losses include power plant use of electricity, transmission and distribution of electricity from power plants to end-use consumers (also called "line-losses"), and unaccounted for electricity. Total losses are allocated to the end-use sectors in proportion to each sector's share of total electricity sales. Overall, approximately 67 percent of total energy input is lost in conversion; of electricity generated, approximately 5 percent is lost in plant use and 9 percent in transmission and distribution. Calculated electrical energy system losses may be less than actual losses, because primary consumption does not include the energy equivalent of utility purchases of electricity from nonutilities and from Canada and Mexico, although they are included in electricity sales. See Table 87.

16. Electricity Sales. Data on the sales of electric utility electricity represent gross electricity output measured at the generator terminals, minus power plant use and transmission and distribution losses. Included in each end-use sector are the following: Commercial Sector—sales of electricity to businesses that generally require less than 1,000 kilowatts of service; Industrial Sector—sales of electricity to businesses that generally require more than 1,000 kilowatts of service; Residential Sector—sales of electricity to residences for household purposes; "Other" Sector—sales of electricity to Government, railways, street lighting authorities, and sales not elsewhere included. See Table 89.

17. Net Summer Capability. Net summer capabilities were first collected on Form EIA-860 for the 1984 data year. Units not assigned a net summer capability rating by the utility were given an estimated rating using a statistical relationship between installed nameplate capacity and net summer capability for each prime mover. To estimate net summer capability from 1949 through 1984, two methods were used. For each prime mover except nuclear and "other," net summer capability estimates were calculated in two steps. First, the unit capacity values reported on Form EIA-860 and the unit start dates contained in the 1984 Generating Unit Reference File (GURF) were used to compute preliminary aggregate estimates of annual net summer capability and installed nameplate capacity. These preliminary estimates were obtained by aggregating unit capacity values for all units in service during a given year. Next, the ratio of the preliminary capability to nameplate estimate was computed for each year and multiplied by the previously published installed nameplate capacity values to produce the final estimates of net summer capability.

The net summer capability data for nuclear and "other" units were used directly from the 1984 GURF for all years. Historical aggregates were then developed using the unit start dates on the GURF.

Historical capacity has also been modified to estimate capability based upon the operable definition. This was accomplished by assuming that nonnuclear generating units became operable between 1 and 4 months prior to their commercial operation dates, depending upon the prime mover and time period. The actual operable dates for nuclear units were used. See Tables 90 and 95.

18. Operable Units. Prior to 1973, the number of "Operable Units at End of Year" includes units that were in commercial operation by December 31 of the stated year. Units decommissioned or inoperative for extended periods were generally included. Also included are two U.S. Department of Energy (DOE)-operated plants that supply electricity to the commercial grid. A third DOE plant, which does not distribute electricity to the grid, is excluded. For 1973 and forward, the number of units includes units issued full-power or operating licenses and generally does not include units in long-term shutdown status. See Table 95.

19. World Primary Energy Production. Includes only crude oil and lease condensate, natural gas plant liquids, dry natural gas, coal, and electricity from hydroelectric power and nuclear power. Crude oil production is measured at the wellhead and includes lease condensate. Natural gas plant liquids are products obtained from processing natural gas at natural gas processing plants, including natural gas plants, cycling plants, and fractionators. Dry natural gas production is that amount of natural gas production that is available to be marketed and consumed as a gas. Coal (anthracite, subanthracite, bituminous, subbituminous, lignite, and brown coal) production is the sum of sales, mine consumption, issues to miners, and issues to coking, briquetting, and other ancillary plants at mines. Coal production data include quantities extracted from surface and underground workings and normally exclude wastes removed at mines or associated preparation plants. The production of electricity from hydroelectric power and nuclear power includes both electric utility and industrial production reported on a net basis, thus excluding electricity that is generally used by the electric power plant for its own operating purposes or electricity losses in the transformers that are considered integral parts of the station. See Tables 103 and 104.

20. Primary Stocks of Petroleum—OECD. Petroleum stocks reported by the Organization for Economic Cooperation and Development (OECD) include those held at (or in) the following locations or facilities: leases, refineries, natural gas processing plants, bulk terminals, tanks associated with pipelines, barges, intercoastal tankers, ocean tankers in port, inland ship bunkers, major final consumers, and the strategic storage reserve. For an individual country, stocks include those held for the account of that country but located in another country. U.S. stocks include those held in the 50 States and the District of Columbia. "Other OECD" includes stocks held in Puerto Rico and the Virgin Islands. The OECD definition of petroleum stocks excludes petroleum in pipelines, rail tank cars, tank trucks, oceangoing ship bunkers, service stations, retail stores, and tankers at sea. An exception is U.S. stocks which include petroleum in pipelines. See Table 109.

Glossary

Additions to Property: The current year's expenditures on property, plant, and equipment. The amount is predicated upon each reporting company's accounting practices. That is, accounting practices with regard to capitalization of certain items may differ across companies, and therefore this figure is a function of each reporting company's policy.

Alcohol: The family name of a group of organic chemical compounds composed of carbon, hydrogen, and oxygen. The molecules in the series vary in chain length and are composed of a hydrocarbon plus a hydroxyl group (CH_3-$(CH_2)n$-OH). Alcohol includes methanol and ethanol.

Anthracite: A hard, black, lustrous coal containing a high percentage of fixed carbon and a low percentage of volatile matter. It is often referred to as hard coal. It includes meta-anthracite and semianthracite and conforms to ASTM Specification D388 for anthracite.

API: The trade association American Petroleum Institute.

API Gravity: An arbitrary scale expressing the gravity or density of liquid petroleum products. The measuring scale is calibrated in terms of degrees API. A low API gravity means a heavy, more dense product.

Apparent Consumption, Natural Gas (international): The total of an individual nation's marketed natural gas production plus imports less exports.

Asphalt: A dark-brown-to-black cement-like material containing bitumens as the predominant constituents, obtained by petroleum processing. The definition includes crude asphalt as well as the following finished products: cements, fluxes, the asphalt content of emulsions (exclusive of water), and petroleum distillates blended with asphalt to make cutback asphalts.

ASTM: The acronym for the American Society for Testing and Materials.

Aviation Gasoline Blending Components: Finished components in the gasoline range that will be used for blending or compounding into finished aviation gasoline.

Aviation Gasoline, Finished: All special grades of gasoline for use in aviation reciprocating engines, as given in ASTM Specification D910. Excludes blending components that will be used in blending or compounding into finished aviation gasoline.

Base Gas: The volume of gas needed as a permanent inventory to maintain adequate underground storage reservoir pressures and deliverability rates throughout the withdrawal season. All native gas is included in the base gas volume.

Bituminous Coal: A coal that is high in carbonaceous matter having a volatility greater than anthracite and a calorific value greater than subbituminous coal. In the United States, it is often referred to as soft coal. It conforms to ASTM Specification D388 for bituminous coal and is used primarily for electricity generation, coke production, and space heating.

British Thermal Unit (Btu): The amount of energy required to raise the temperature of 1 pound of water 1 °F at or near 39.2 °F. One Btu is equivalent to about 252 International Steam Table calories. An average Btu content of fuel is a heat value per unit quantity of fuel as determined from tests of fuel samples.

Butane: A normally gaseous, paraffinic hydrocarbon (C_4H_{10}) extracted from natural gas or refinery gas streams. It includes isobutane (branch-chain) and normal butane (straight-chain) and is covered by ASTM Specification 1835 and Natural Gas Processors Specifications for commercial butane. It is used primarily for blending into high-octane gasoline, for residential and commercial heating, and for industrial purposes, especially the manufacture of chemicals and synthetic rubber.

Butylene: A normally gaseous, olefinic hydrocarbon (C_4H_8) recovered from refinery processes. Quantities are included with "normal butane" data.

Capacity Factors at Electric Utilities: Annual capacity factors are averages of the monthly values for that year. The monthly capacity factors are computed as the actual monthly generation divided by the maximum possible generation for that month. The maximum possible generation is the number of hours in the month multiplied by the net monthly maximum dependable capacity. This fraction is then multiplied by 100 to obtain a percentage.

Class A Electric Utility: An electric utility having annual electric operating revenues of $2.5 million or more during the previous calendar year. Through 1979, electric utility data are for all Class A electric utilities. From 1980 through 1983, electric utility data are for selected Class A electric utilities (those having annual electric operating revenues of $100 million or more during the previous calendar year).

Class B Electric Utility: A utility having annual electric operating revenues of $1.0 million or more but less than $2.5 million. (Class B utilities are not included in data for 1980 through 1983.)

Coal: Includes all ranks of coal—anthracite, bituminous coal, subbituminous coal, and lignite—conforming to ASTM Specification D388.

Coal Coke: The strong, porous residue, consisting of carbon and mineral ash, that is formed when the volatile constituents of bituminous coal are driven off by heat in the absence of or in a limited supply of air. It is used primarily in blast furnaces for smelting ores, especially iron ore.

Cogenerators: Generally, industrial, commercial, or other manufactures that use steam, heat, or resultant energy for the dual use of processing materials and generating electricity.

Commercial Building: A structure that is totally enclosed by walls that extend from the foundation to the roof and that is used solely or, if residential, used partially for commercial purposes. Also included are buildings used for both commercial and industrial purposes or both commercial and agricultural purposes if the major activity is commercial. Excluded are buildings used solely for residential purposes, buildings used primarily for industrial or agricultural activity, and U.S. government buildings on military bases or reservation. In addition to retail stores and office buildings, commercial buildings include, but are not limited to, schools, churches, gymnasiums, libraries, museums, hospitals, clinics, warehouses, restaurants, lodgings, and jails.

Commercial Sector: Nonmanufacturing business establishments, including hotels, motels, restaurants, wholesale businesses, retail stores, laundries, and other service enterprises; health, social, and educational institutions; and Federal, State, and local governments. Street lights, pumps, bridges, and public services are also included. (For allocation of individual fuels to end-use sectors, see the Explanatory Notes.)

Constant Dollars: A price, expenditure, or value that has been adjusted to account for inflation. Amounts expressed in constant dollars reflect buying power relative to a base year.

Cost, Insurance, and Freight (C.I.F.): A term used in sales price contracts for both domestic and export sales. In general, the sales price includes the cost of the goods, the freight charges to a named destination, and the insurance charges on the goods shipped. The seller may waive insurance and choose to assume responsibility for any loss or damage. Regarding domestic coal sales, the sales price includes all charges for delivering the coal to the electric power utility excluding demurrage at the plant and unloading charges. Federal Power Commission Form 423, on which these data are collected, refers to this price as "f.o.b. plant" price.

Crude Oil Average Domestic First Purchase Price: The average price at which all domestic crude oil is purchased. Prior to February 1976, the price represented an estimate of the average of posted prices; after February 1976, the price represents an average of actual first purchase prices. This price is frequently called the wellhead price.

Crude Oil (including lease condensate): A mixture of hydrocarbons that exists in liquid phase in underground reservoirs and remains liquid at atmospheric pressure after passing through surface separating facilities. Included are lease condensate and liquid hydrocarbons produced from tar sands, gilsonite, and oil shale. Drip gases are also included, but topped crude oil (residual oil) and other unfinished oils are excluded. Liquids produced at natural gas processing plants and mixed with crude oil are excluded where identifiable.

Crude Oil Refinery Input: Total crude oil (including lease condensate) input to crude oil distillation units and other processing units.

Crude Oil Stocks: Stocks of crude oil and lease condensate held at refineries, in pipelines, at pipeline terminals, and on leases.

Current Dollars: A price, expenditure, or value that represents the price actually paid for a product or service at the time of the transaction.

Demonstrated Reserve Base of Coal: Known in-place coals of all rank that are technically and economically minable at the time of evaluation. It includes measured and indicated coal resources. It is estimated that at least one-half of the in-place coals can be recovered. (See **Indicated Resources, Coal** and **Measured Resources, Coal.**)

Development Well: A well drilled within the proved area of an oil or gas reservoir to the depth of a stratigraphic horizon known to be productive.

Distillate Fuel Oil: Light fuel oils distilled during the refining process and used primarily for space heating, on- and off-highway diesel engine fuel (including railroad engine fuel and fuel for agricultural machinery), and electric power generation. Included are products known as No. 1, No. 2, and No. 4 fuel oils, and No. 1, No. 2, and No. 4 diesel fuels, conforming to ASTM Specifications D396 or D975, respectively. No. 1 fuel oil is a light distillate fuel oil used in vaporizing pot-type burners. No. 2 fuel oil is used in atomizing-type burners for domestic heating or for moderate capacity commercial-industrial burner units. No. 4 fuel oil is a blend of distillate fuel oil and residual fuel oil that is used in commercial burner installations not equipped with preheating facilities; it is used extensively in industrial plants. Diesel fuel oils are used in compression-ignition engines.

Distillation Unit, Atmospheric: The primary distillation unit that processes crude oil (including mixtures of other hydrocarbons) at approximately atmospheric conditions. It includes a pipe still for vaporizing the crude oil and a fractionation tower for separating the vaporized hydrocarbon elements in the crude oil into fractions with different boiling ranges. Fractionation consists of continuously vaporizing and condensing the components to separate higher boiling point material from lower boiling point material. The selected boiling ranges are set by the processing scheme, the properties of the crude oil, and the product specifications.

Dry Hole: An exploratory or development well found to be incapable of producing either oil or gas in sufficient quantities to justify completion as an oil or gas well.

Electric Utility: A corporation, person, agency, authority, or other entity that owns or operates facilities for the generation, transmission, distribution, or sale of electricity, primarily for use by the public.

Electric Utility Sector: Privately and publicly owned establishments that generate electricity primarily for use by the public.

Eliminations: Revenues and expenses resulting from transactions between segments. Consolidated company accounts do not include intersegment revenues and expenses. Therefore, such intersegment transactions must be eliminated.

End-Use Energy Consumption: Total energy consumption less losses incurred in the generation, transmission, and distribution of electricity, less power plant electricity use and unaccounted for electrical system energy losses. It is also the sum of fossil fuel consumption in the residential, commercial, industrial, and transportation end-use sectors plus electric utility sales to these sectors and generation of hydroelectric power by non-electric utilities.

Energy-Weighted Industrial Output: The weighted sum of real output for all two-digit Standard Industrial Classification (S.I.C.) manufacturing industries plus agriculture, construction, and mining. The weight for each industry is the ratio between the quantity of end-use energy consumption and the value of real output. The base year for these weights is either 1981 or 1982, depending on data availability.

Ethane: A normally gaseous, paraffinic hydrocarbon (C_2H_6) extracted from natural gas or refinery gas streams. It is used primarily as petrochemical feedstock for production of chemicals and plastic materials.

Ethylene: A normally gaseous, olefinic hydrocarbon (C_2H_4) recovered from refinery processes. Quantities are included with "ethane" data.

Exploratory Well: A well drilled to find and produce oil or gas in an unproved area; to find a new reservoir in a field previously found to be productive of oil or gas in another reservoir; or to extend the limit of a known oil or gas reservoir.

Exports: Shipments of goods from the 50 States and the District of Columbia to foreign countries, Puerto Rico, the Virgin Islands, and other U.S. possessions and territories.

Extraction Loss: The reduction in volume of natural gas due to the removal of natural gas constituents, such as ethane, propane, and butane, at natural gas processing plants.

F.a.s. (free alongside ship): The f.a.s. price is based on the purchase price (the actual transaction value of merchandise at the foreign port of export) and generally includes all charges incurred in placing the merchandise alongside the carrier at the foreign port.

Federally Administered Lands: Includes all public lands (Federal), Indian lands, Naval Petroleum Reserve, National Petroleum Reserve (Alaska), Outer Continental Shelf, and acquired lands (lands formerly held by the Department of Agriculture and now under the jurisdiction of the Department of the Interior). Beginning on October 1, 1984, the National Petroleum Reserve was transferred to Alaskan Natives.

F.o.b. (free on board): The f.o.b. price includes all charges incurred in delivering merchandise and placing it on board the carrier. In general, the seller assumes responsibility and all costs up to the specific point of delivery; the buyer assumes responsibility and costs thereafter.

Forward Costs: All operating and capital costs (in current dollars) still to be incurred in the production of uranium from estimated resources. Excluded are previous expenditures (such as property and mill acquisition), taxes, profit, and the cost of money. Experience has shown that forward costs are generally lower than market prices.

Fossil Fuel Steam-Electric Power Plant: An electricity generation plant in which the prime mover is a turbine rotated by high-pressure steam produced in a boiler by heat from burning fossil fuels.

Gasohol: A blend of finished motor gasoline (leaded or unleaded) and alcohol (generally ethanol but sometimes methanol) in which 10 percent or more of the product is alcohol.

Gas Well: A well completed for the production of natural gas from one or more gas zones or reservoirs. (Wells producing both crude oil and natural gas are classified as oil wells.)

Gas Well Productivity: Derived annually by dividing gross natural gas withdrawals from gas wells by the number of producing gas wells on December 31 and then dividing the quotient by the number of days in the year.

Geothermal Energy (as used at electric utilities): Hot water or steam, extracted from geothermal reservoirs in the earth's crust, which is supplied to steam turbines at electric utilities that drive generators to produce electricity.

Gross Input to Distillation Units: The volume of crude oil, lease condensate, natural gas plant liquids, unfinished oils, liquefied refinery gases, slop oils, and other liquid hydrocarbons that are processed through crude oil distillation units.

Gross National Product (GNP): The total value of goods and services produced by the Nation's economy, before deduction of depreciation charges and other allowances for capital consumption. It includes the total purchases of goods and services by private consumers and government, gross private domestic capital investment, and net foreign trade.

Gross National Product (GNP) Implicit Price Deflator: The implicit price deflator, published by the Department of Commerce, Bureau of Economic Analysis, is used to convert current-dollars figures to constant-dollar figures.

Household: A group of 12 or fewer persons who occupy the same housing unit (see **Housing Unit)** as their usual or permanent place of residence. Persons include babies, lodgers, boarders, and persons who live in the housing unit but are traveling or in a hospital. Excluded are persons who are away from home as college students or members of the Armed Services.

Housing Unit: A structure or part of a structure in which a household (see **Household**) lives or could live, with access to the outside of the building either directly or through a common hall. Housing units do not include group quarters, such as prisons, hospitals, dormitories, nursing homes, fraternity/sorority houses, or convents, in which 10 or more unrelated persons live. Hotel and motel rooms, mobile homes, and trailers are considered housing units if permanently occupied by a household.

Hydroelectric Power: Electricity generated by an electric power plant whose turbines are driven by falling water.

Imports: Receipts of goods into the 50 States and the District of Columbia from foreign countries, Puerto Rico, the Virgin Islands, and other U.S. possessions and territories. (See **Petroleum Imports.)**

Indicated Resources, Coal: Coal resources for which estimates for the rank, quality, and quantity have been computed partly from sample analyses and measurements and partly from reasonable geologic projections. (See **Demonstrated Reserve Base of Coal.)**

Industrial Sector: Manufacturing, construction, mining, agriculture, fishing, and forestry establishments. (For allocation of individual fuels to end-use sectors, see the Explanatory Notes.)

International Bunkers: Fuel loaded on vessels and aircraft engaged in international commerce for use as fuel by the vessel or aircraft.

Isobutane: See **Butane.**

Jet Fuel: Includes both naphtha-type and kerosene-type jet fuel meeting standards for use in aircraft turbine engines or meeting ASTM Specification D1655. Although most jet fuel is used in aircraft, some is used for other purposes, such as fuel for turbines to produce electricity.

Kerosene: A petroleum middle distillate having burning properties suitable for use as an illuminant when burned in wick lamps. Included are No. 1-K and No. 2-K recognized in ASTM Specification D3699 and grades of kerosene called range oil having properties similar to No. 1 fuel oil. Kerosene is used primarily in space heaters, cooking stoves, and water heaters.

Landed Cost of Crude Oil Imports: The price of imported crude oil at the port of discharge. It includes the purchase price at the foreign port plus charges for transporting and insuring the crude oil from the purchase point to the port of discharge. It does not include import tariffs or fees, wharfage charges, or demurrage costs. Coverage includes the United States and its territories.

Lease and Plant Fuel: Natural gas used in lease operations, as gas processing plant fuel, and as net used for gas lift.

Lease Condensate: A natural gas liquid recovered from gas-well gas (associated and nonassociated) in lease separators or natural gas field facilities. Lease condensate consists primarily of pentanes and heavier hydrocarbons. Generally, it is blended with crude oil for refining.

Lignite: A brownish-black coal of low rank with high inherent moisture and volatile matter. It is also referred to as brown coal. It conforms to ASTM Specification D388 for lignite and is used almost exclusively for electric power generation.

Line-Miles of Seismic Exploration: The distance along the Earth's surface that is covered by seismic surveying.

Liquefied Natural Gas (LNG): Natural gas (primarily methane) that has been liquefied by reducing its temperature to minus 260 °F at atmospheric pressure.

Liquefied Petroleum Gases (LPG): Ethane, propane, normal butane, ethane-propane mixtures, propane-butane mixtures, and isobutane produced at natural gas processing plants, including plants that fractionate raw natural gas plant liquids. LPG also includes liquefied refinery gases (ethylene, propylene, butylene, and isobutylene produced from crude oil at refineries).

Liquefied Refinery Gases (LRG): Ethylene, propylene, butylene, and isobutylene produced from crude oil at refineries. (See **Liquefied Petroleum Gases.**)

Low-Temperature Solar Collector: A collector that generally operates in the temperature range below 110 °F. Typically, it has no glazing or insulation and is made of plastic or rubber, although some are made of metal. (See **Solar Thermal Collector.**)

Lubricants: Substances used to reduce friction between bearing surfaces. Petroleum lubricants may be produced either from distillates or residues. Other substances may be added to impart or improve certain required properties. Lubricants include all grades of lubricating oils from spindle oil to cylinder oil and those used in greases. The three categories include bright stock lubricants, neutral lubricants, and other lubricants (lubricating oil base stock used in finished lubricating oils and greases, including black, coastal, and red oils).

Major Electric Utility: A utility that, in the last three consecutive calendar years, had sales or transmission services exceeding one of the following: (1) 1 million megawatthours of total annual sales; (2) 100 megawatthours of annual sales for resale; (3) 500 megawatthours of annual gross interchange out; or (4) 500 megawatthours of wheeling (deliveries plus losses) for others.

Measured Resources, Coal: Coal resources for which estimates of the quality and quantity have been computed within a margin of error of less than 20 percent, by analyzing measurements taken from closely spaced, geologically well-known sample sites. (See **Demonstrated Reserve Base of Coal.**)

Medium-Temperature Solar Collector: A collector that generally operates in the temperature range of 140 °F to 180 °F but may operate at temperatures as low as 110 °F. Typically, it has one or two glazings, a metal frame, a metal absorption panel with integral flow channels or attached tubing (liquid collector) or with integral ducting (air collector), and insulation on the sides and back of the panel. (See **Solar Thermal Collector.**)

Metallurgical Coal: A high-quality bituminous coal suitable for making coal coke.

Metropolitan Area: A group of households located within a Metropolitan Statistical Area (MSA) as defined in the 1980 Census. Except in New England, an MSA is a county or group of contiguous counties that contain at least one city of 50,000 inhabitants or more, or "twin cities" with a combined population of at least 50,000. The contiguous counties are included in an MSA if, according to certain criteria, they are essentially metropolitan in character and are socially and economically integrated with the central city. In New England, MSA's consist of towns and cities, rather than counties.

Miscellaneous Petroleum Products: Includes all finished petroleum products not classified elsewhere, e.g., petrolatum, absorption oils, ramjet fuel, petroleum rocket fuels, synthetic natural gas feedstocks, specialty oils, and medicinal oils.

Motor Gasoline Blending Components: Finished components in the gasoline range that will be used for blending or compounding into finished motor gasoline. Pool gasoline (gasoline needing no processing other than blending) is included in this category.

Motor Gasoline, Finished: A complex mixture of relatively volatile hydrocarbons, with or without small quantities of additives, that have been blended to form a fuel suitable for use in spark-ignition engines and conforming to ASTM Specification D439. Included are finished leaded gasoline, finished unleaded gasoline, and gasohol. Excluded are blendstock that has not been blended into finished motor gasoline and alcohol that has not been blended into gasohol.

Motor Gasoline, Leaded Premium: A gasoline having an antiknock index of 93 with the use of lead additives or which contains more than 0.05 grams of lead per gallon or more than 0.005 grams of phosphorus per gallon. Includes gasohol.

Motor Gasoline, Leaded Regular: A gasoline having an antiknock index of 89 with the use of lead additives or which contains more than 0.05 grams of lead per gallon or more than 0.005 grams of phosphorus per gallon.

Motor Gasoline, Total: Includes finished leaded motor gasoline (premium and regular), finished unleaded motor gasoline (premium and regular), motor gasoline blending components, and gasohol.

Motor Gasoline, Unleaded Premium: A gasoline having an antiknock index of 90 containing not more than 0.05 grams of lead per gallon and not more than 0.005 grams of phosphorus per gallon. Includes gasohol.

Motor Gasoline, Unleaded Regular: A gasoline having an antiknock index of 87 containing not more than 0.05 grams of lead per gallon and not more than 0.005 grams of phosphorus per gallon.

Naphtha: A generic term applied to a petroleum fraction with an approximate boiling range of between 122 °F and 400 °F.

Native Gas: Gas in place at the time that a reservoir was converted to use as an underground storage reservoir. Excludes quantities of gas added or injected.

Natural Gas: A mixture of hydrocarbons (principally methane) and small quantities of various nonhydrocarbons existing in the gaseous phase or in solution with crude oil in underground reservoirs.

Natural Gas, Dry Production: Derived by subtracting extraction loss from "marketed production." It represents the amount of domestic gas production that is available to be marketed and consumed as a gas.

Natural Gas, End-Use Average Price: Average price per specified unit, including all taxes, at the point of consumption.

Natural Gas Gross Withdrawals: Full well stream volume of produced natural gas excluding condensate separated at the lease.

Natural Gas Liquids (NGL): Those hydrocarbons in natural gas that are separated as liquids from the gas. Natural gas liquids include natural gas plant liquids (primarily ethane, propane, butane, and isobutane produced at natural gas processing plants) and lease condensate (primarily pentanes plus produced from natural gas at lease separators and field facilities). (See **Natural Gas Plant Liquids** and **Lease Condensate.**)

Natural Gas, Marketed Production: This quantity is derived. It is gross withdrawals of natural gas from production reservoirs, less gas used for reservoir repressuring, quantities vented and flared, and nonhydrocarbon gases removed in treating and processing operations.

Natural Gas Plant Liquids (NGPL): Those natural gas liquids that are recovered from natural gas processing plants, and in some situations, from natural gas field facilities, as well as those that are extracted by fractionators. Natural gas plant liquids are defined according to the published specifications of the ASTM and the Gas Processors Association and are classified as follows: ethane, propane, normal butane, isobutane, pentanes plus, and other products from natural gas processing plants (i.e., products meeting the standards for finished petroleum products produced at natural gas processing plants, such as finished motor gasoline, finished aviation gasoline, special naphthas, kerosene, distillate fuel oil, and miscellaneous products).

Natural Gas Wellhead Price: The annual wellhead price of natural gas is calculated by dividing the total reported value at the wellhead by the total quantity produced as reported by the appropriate agencies of individual producing States, as well as by the U.S. Geological Survey (through 1981) and the U.S. Minerals Management Service (from 1982 forward). The price includes all costs prior to shipment from the lease including gathering and compression costs in addition to State production, severance, and similar charges.

Natural Gas, Wet: Natural gas prior to the extraction of liquids and other miscellaneous products.

Net Electricity Generation: Gross generation less electricity consumed at the generating plant for station use. Electricity required for pumping at pumped-storage plants is regarded as plant use and is deducted from gross generation.

Net Income: Operating income plus earnings from unconsolidated affiliates; gains from disposition of property, plant, and equipment; minority interest income; and foreign currency translation effects less income taxes, extraordinary items, and the cumulative effect of accounting changes.

Net Ownership Interest: The sum of net working interest and royalty interest (see **Net Working Interest** and **Royalty Interest**). Net ownership interest applies to both production and reserves.

Net Property Investment: The original cost of property, plant, and equipment (PP&E), less accumulated depreciation.

Net Summer Capability: The steady hourly output that generating equipment is expected to supply to system load, exclusive of auxiliary power, as demonstrated by test at the time of summer peak demand.

Net Working Interest: A company's working interest, not including any basic royalty or overriding royalty interests. (See **Working Interest.**)

Nonhydrocarbon Gases: Typical nonhydrocarbon gases which may be present in reservoir natural gas are carbon dioxide, helium, hydrogen sulfide, and nitrogen.

Nonmetropolitan Area: Households not located within Metropolitan Statistical Areas as defined in the 1980 Census.

Nontraceables: Those revenues, costs, assets, and liabilities that cannot be directly attributed to a type of business or that cannot be assigned to a type of business by use of a reasonable allocation method developed on the basis of operating-level realities.

Normal Butane: See **Butane.**

Nuclear Energy: Electricity generated by an electric power plant whose turbines are driven by steam generated in a reactor by heat from the fissioning of nuclear fuel.

Oil Well: A well completed for the production of crude oil from one or more oil zones or reservoirs. Wells producing both crude oil and natural gas are classified as oil wells.

Operable Refineries: Operable refineries include those that were in one of the following three categories at the beginning of the year: (1) in operation; (2) not in operation and not under active repair but capable of being placed into operation within 30 days; or (3) not in operation but under active repair that can be completed within 90 days.

Operating Income: Operating revenues less operating expenses. Excludes items of other revenue and expense such as equity in earnings of unconsolidated affiliates, dividends, interest income and expense, income taxes, extraordinary items, and cumulative effect of accounting changes.

Organization for Economic Cooperation and Development (OECD): Current members: Australia, Austria, Belgium, Canada, Denmark, Finland, France, West Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, and the United States and its territories (Guam, Puerto Rico, and the Virgin Islands).

Organization of the Petroleum Exporting Countries (OPEC): Current members: Algeria, Ecuador, Gabon, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates, and Venezuela.

Other Hydrocarbons (petroleum data): Other materials processed at refineries. Includes coal tar derivatives, hydrogen, gilsonite, and natural gas received by the refinery for reforming into hydrogen.

Pentanes Plus: A mixture of hydrocarbons, mostly pentanes and heavier, extracted from natural gas. This product includes isopentane, natural gasoline, and plant condensate.

Petrochemical Feedstocks: Chemical feedstocks derived from petroleum, principally for the manufacture of chemicals, synthetic rubber, and a variety of plastics. The categories reported are "naphtha less than 400 °F end-point" and "other oils over 400 °F end-point."

Petroleum: A generic term applied to oil and oil products in all forms, such as crude oil, lease condensate, unfinished oils, petroleum products, natural gas plant liquids, and nonhydrocarbon compounds blended into finished petroleum products.

Petroleum Coke: A solid residue that is the final product of the condensation process in cracking. It consists of aromatic hydrocarbons very poor in hydrogen. Calcination of petroleum coke can yield almost pure carbon or artificial graphite suitable for production of carbon or graphite electrodes, structural graphite, motor brushes, dry cells, and similar products. This product is reported as marketable or catalyst coke.

Petroleum Imports: Imports of petroleum into the 50 States and the District of Columbia from foreign countries, Puerto Rico, the Virgin Islands, and other U.S. territories and possessions. Included are imports for the Strategic Petroleum Reserve and withdrawals from bonded warehouses for onshore consumption, offshore bunker use, and military use. Excluded are receipts of foreign petroleum into bonded warehouses and into U.S. territories and U.S. Foreign Trade Zones.

Petroleum Products: Petroleum products are obtained from the processing of crude oil (including lease condensate), natural gas, and other hydrocarbon compounds. Petroleum products include unfinished oils, liquefied petroleum gases, pentanes plus, aviation gasoline, motor gasoline, naphtha-type jet fuel, kerosene-type jet fuel, kerosene, distillate fuel oil, residual fuel oil, naphtha less than 400 °F end-point, other oils over 400 °F end-point, special naphthas, lubricants, waxes, petroleum coke, asphalt, road oil, still gas, and miscellaneous products.

Petroleum Products Supplied: See Explanatory Note 5.

Petroleum Stocks, Primary: Stocks of crude oil or petroleum products held in storage at (or in) leases, refineries, natural gas processing plants, pipelines, tankfarms, and bulk terminals that can store at least 50,000 barrels of petroleum products or that can receive petroleum products by tanker, barge, or pipeline. Crude oil that is in transit from Alaska, or that is stored on Federal leases or in the Strategic Petroleum Reserve, is included. Excluded are stocks of foreign origin that are held in bonded warehouse storage.

Photovoltaic and Solar Thermal Energy (as used at electric utilities): Energy radiated by the sun as electromagnetic waves (electromagnetic radiation) that is converted at electric utilities into electricity by means of solar (photovoltaic) cells or concentrating (focusing) collectors.

Photovoltaic Module: A group of photovoltaic cells. (Cells are solid-state devices that produce electricity when exposed to sunlight.) The electricity is used primarily in applications requiring remote power, such as radio communication, cathodic protection, and navigational aids.

Plant Condensate: One of the natural gas plant liquids, mostly pentanes and heavier hydrocarbons, recovered and separated as liquids at gas inlet separators or scrubbers in processing plants. Plant condensate is not suitable for blending into finished motor gasoline. It is usually blended with crude oil for distilling or processed at other refinery units.

Primary Energy Consumption Expenditures: Expenditures for energy consumed in each of the four major end-use sectors, excluding energy in the form of electricity, plus expenditures by the electric utilities sector for energy used to generate electricity. There are no fuel-associated expenditures for hydroelectric power, geothermal energy, photovoltaic and solar energy, or wind energy. Also excluded are the quantifiable consumption expenditures that are an integral part of process fuel consumption. (See **Process Fuel.**)

Process Fuel: All energy consumed in the acquisition, processing, and transportation of energy. Quantifiable process fuel includes three categories: natural gas lease and plant operations, natural gas pipeline operations, and oil refinery operations.

Processing Gain: The amount by which the total volume of refinery output is greater than the volume of input for a given period of time. The processing gain arises when crude oil and other hydrocarbons are processed into products that are, on average, less dense than the input.

Processing Loss: The amount by which the total volume of refinery output is less than the volume of input for a given period of time. The processing loss arises when crude oil and other hydrocarbons are processed into products that are, on average, more dense than the input.

Propane: A normally gaseous, paraffinic hydrocarbon (C_3H_8). It is extracted from natural gas or refinery gas streams, and includes all products covered by Gas Processors Association Specifications for commercial propane and HD-5 propane and ASTM Specification D1835. Propane is used primarily for residential and commercial heating and cooling, and also as a fuel for transportation. Industrial uses of propane include use as a petrochemical feedstock.

Propylene: A normally gaseous, olefinic hydrocarbon (C_3H_6) recovered from refinery processes. Quantities are included with "propane" data.

Proved Reserves, Crude Oil: The estimated quantities of all liquids statistically defined as crude oil that geological and engineering data demonstrate with reasonable certainty to be recoverable in future years from known reservoirs under existing economic and operating conditions.

Proved Reserves, Natural Gas: The estimated quantities of natural gas that analysis of geological and engineering data demonstrate with reasonable certainty to be recoverable in future years from known crude oil and natural gas reservoirs under existing economic and operating conditions.

Proved Reserves, Natural Gas Liquids: Estimates include: (1) reserves of liquids that are expected to be recovered from associated and nonassociated gas produced from gas wells and processed through lease separators, and (2) reserves of liquids expected to be recovered from associated-dissolved and nonassociated gas when processed in field facilities or gas processing plants. Estimates of proved reserves of natural gas liquids are based on (1) proved reserves of natural gas at the time of estimation, and (2) rates at which liquids can be recovered from natural gas by using processing equipment of the type currently installed or planned at the time of estimation.

Refiner Acquisition Cost of Crude Oil: The average price paid by refiners for crude oil booked into their refineries in accordance with accounting procedures generally accepted and consistently and historically applied by the refiners concerned. (Also see Explanatory Note 8.)

Refinery Input: The total amount of crude oil and lease condensate input to crude oil distillation units and other refinery processing units.

Refinery Output: The total amount of petroleum products produced at a refinery. Includes petroleum consumed by the refinery.

Renewable Energy: Energy obtained from sources that are essentially inexhaustible (unlike, for example, the fossil fuels, of which there is a finite supply). Renewable sources of energy include wood, waste, geothermal, wind, photovoltaic, and solar thermal energy.

Reservoir Repressuring: The injection of natural gas into oil and gas reservoir formations for pressure maintenance and cycling.

Residential Sector: Private household establishments, which consume energy primarily for space heating, water heating, air conditioning, lighting, refrigeration, cooking, and clothes drying. (For allocation of individual fuels to end-use sectors, see the Explanatory Notes.)

Residual Fuel Oil: The heavier oils that remain after the distillate fuel oils and lighter hydrocarbons are distilled away in refinery operations and that conform to ASTM Specifications D396 and 975. Included are No. 5, a residual fuel oil of medium viscosity; Navy Special, for use in steam-powered vessels in government service and in shore power plants; and No. 6, which includes Bunker C fuel oil, and is used for commercial and industrial heating and electricity generation. Imports of residual fuel oil include imported crude oil burned as fuel.

Residue Gas: Natural gas from which natural gas processing plant liquid products and, in some cases, nonhydrocarbon components have been extracted.

Road Oil: Any heavy petroleum oil, including residual asphaltic oil used as a dust palliative and surface treatment on roads and highways. It is generally produced in six grades from 0, the most liquid, to 5, the most viscous.

Rotary Rig: A machine, used for drilling wells, that employs a rotating tube attached to a bit for boring holes through rock.

Royalty Interest: An interest in a mineral property provided through a contractual arrangement that gives the owner of the interest the right to a fractional share of production, or proceeds therefrom, that does not contain rights and obligations of operating a mineral property, and that is normally free and clear of exploration, development, and operating costs, except production taxes.

Rural Area: A place that had a population of less than 2,500 as of the 1970 Census.

Solar Thermal Collector: A device designed to receive solar radiation and convert it into thermal energy. Normally, a solar thermal collector includes a frame, glazing, and an absorber together with appropriate insulation. The heat collected by the solar thermal collector may be used immediately or stored for later use.

Special Naphthas: All finished products within the gasoline range, specially refined to a specified flash point and boiling range, for use as paint thinners, cleaners, and solvents, including commercial hexane conforming with ASTM Specification D1836, and cleaning solvent conforming to ASTM Specification D484. Excluded are naphthas to be blended or marketed as motor gasoline or aviation gasoline, or to be used as petrochemical and synthetic natural gas (SNG) feedstock.

Special Solar Collector: An evacuated tube collector or a concentrating (focusing) collector. Special collectors operate in the temperature range from just above ambient temperature (low concentration for pool heating) to several hundred degrees Fahrenheit (high concentration for air conditioning and specialized industrial processes). (See **Solar Thermal Collector.**)

Spot Price: A transaction price concluded "on the spot," that is, on a one-time, prompt basis; usually the transaction involves only one specific quantity of product. This contrasts with a term contract sale price, which obligates the seller to deliver a product at an agreed frequency and price over an extended period.

Startup Test Phase of Nuclear Power Plant: A nuclear power plant that has been licensed by the Nuclear Regulatory Commission to operate, but is in the initial testing phase during which production of electricity may not be continuous. In general, when the electric utility is satisfied with the plant's performance, it formally accepts the plant from the manufacturer, and places it in "commercial operation" status. A request is then submitted to the appropriate utility rate commission to include the power plant in the rate base calculation.

Still Gas (refinery gas): Any form or mixture of gas produced in refineries by distillation, cracking, reforming, and other processes. The principal constituents are methane, ethane, ethylene, normal butane, butylene, propane, and propylene. It is used primarily as refinery fuel and petrochemical feedstock.

Strategic Petroleum Reserve (SPR): Petroleum stocks maintained by the Federal Government for use during periods of major supply interruption.

Stripper Well Property: A property whose average daily production of crude oil per well (excluding condensate recovered in nonassociated natural gas production) did not exceed an average of 10 barrels per day during any preceding consecutive 12-month period beginning after December 31, 1972.

Subbituminous Coal: A dull black coal of rank intermediate between lignite and bituminous coal. It conforms to ASTM Specification D388 for subbituminous coal, and is used almost exclusively for electric power generation.

Supplemental Gaseous Fuels: Consist primarily of synthetic natural gas, propane-air, and refinery (still) gas. May also include coke oven gas, biomass gas, manufactured gas, and air injected for Btu stabilization.

Synthetic Natural Gas (SNG): A product resulting from the manufacture, conversion, or reforming of hydrocarbons that may be easily substituted for, or interchanged with, pipeline-quality natural gas.

Transportation Sector: Private and public vehicles that move people and commodities. Included are automobiles, trucks, buses, motorcycles, railroads and railways (including streetcars), aircraft, ships, barges, and natural gas pipelines.

Unaccounted for Crude Oil: Represents the arithmetic difference between the indicated demand for crude oil and the total disposition of crude oil. Indicated demand is the sum of crude oil production and imports less changes in crude oil stocks. Total disposition of crude oil is the sum of crude oil input to refineries, crude oil exports, crude oil burned as fuel, and crude oil losses.

Undiscovered Recoverable Resources (crude oil and natural gas): Those economic resources of crude oil and natural gas, yet undiscovered, that are estimated to exist in favorable geologic settings.

Unfinished Oils: Includes all oils requiring further refinery processing, except those requiring only mechanical blending.

Unfractionated Streams: Mixtures of unsegregated natural gas liquid components, excluding those in plant condensate. This product is extracted from natural gas.

United States: Unless otherwise noted, "United States" in this publication means the 50 States and the District of Columbia. U.S. exports include shipments to U.S. Territories, and imports include receipts from U.S. Territories.

Uranium Resources: Uranium resource estimates are divided into three separate categories reflecting different levels of confidence in the quantities estimated. They are reasonably assured resources, estimated additional resources, and speculative resources. Reasonably assured resources refers to uranium in known mineral deposits of such size, grade, and configuration that it could be recovered within the given cost ranges, with currently proven mining and processing technology. Estimated additional resources refers to uranium in addition to reasonably assured resources that is expected to occur, mostly on the basis of direct geological evidence, in extensions of well-explored deposits, in deposits in which geological continuity has been well established, as well as deposits believed to exist in well-defined geological trends or areas of mineralization with known deposits. Such deposits in this category can be discovered and delineated and the uranium subsequently recovered, all within a given cost range. Speculative resources refers to uranium in addition to estimated additional resources that is thought to exist, mostly on the basis of indirect evidence and geological extrapolations.

Urban Area: A place that had a population of 2,500 or more as of the 1970 Census.

Vented and Flared: Vented natural gas is gas that is released into the air; flared natural gas is gas that is burned in flares.

Waxes: Solid or semi-solid materials derived from petroleum distillates or residues. Waxes are light-colored, more or less translucent crystalline masses, slightly greasy to the touch, consisting of a mixture of solid hydrocarbons in which the paraffin series predominates. Includes all marketable waxes, whether crude scale or fully refined. Waxes are used primarily as industrial coatings for surface protection.

Well: A hole drilled for the purpose of finding or producing crude oil or natural gas or providing services related to the production of crude oil or natural gas. Wells are classified as oil wells, gas wells, dry holes, stratigraphic or core tests, or service wells.

Wind Energy (as used at electric utilities): The kinetic energy of wind converted at electric utilities into mechanical energy by wind turbines (i.e., blades rotating from a hub) that drive generators to produce electricity for distribution.

Wood and Waste (as used at electric utilities): Wood energy (see **Wood Energy**), garbage, bagasse, sewerage gas and other industrial, agricultural, and urban refuse used to generate electricity for distribution.

Wood Energy: Wood and wood products used as fuel. Included are round wood (cord wood), limb wood, wood chips, bark, sawdust, forest residues, charcoal, pulp waste, and spent pulping liquor.

Working Gas: The volume of gas in an underground storage reservoir above the designed level of the base. It may or may not be completely withdrawn during any particular withdrawal season. Conditions permitting, the total working capacity could be used more than once during any season.

Working Interest: An interest in a mineral property that entitles the owner of that interest to all or a share of mineral production from the property, usually subject to a royalty.

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Numbers for the Nation

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24,600 median family income 11.7% 65 years or more 316.1 consumer price index
19.4 billion exports 30.9 years median age 713 motor vehicles per 1,000 people 68% registered
693 per capita income 234.5 million population 1,833,000 housing starts 82,341 state and local
9 per 1,000 birth rate 517,000 immigrants 76% population in metro areas $592.6 billion manufactures
homeownership rate 5,800 crimes per 100,000 people 73.3% high school grads 2,763,992 federal
079 tax revenue per capita $4,705 retail sales per capita 7.4% unemployment 2,478,642 farms
persons per square mile 15.2% poverty rate $22,029 average teacher salary 10.8 million enrolled
median family income 11.7% 65 years or more 316.1 consumer price index 268 million people
households 8.5 per 1,000 death rate 22.4% employed in manufacturing 28.2 inches average
exports 30.9 years median age 713 motor vehicles per 1,000 people 68%
income 234.5 million population 1,833,000 housing starts 82,341 state and
rate 517,000 immigrants 76% population in metro areas $592.6 billion
5,800 crimes per 100,000 people 73.3% high school grads
4,705 retail sales per capita 7.4% unemployment
verty rate $22,029 average teacher salary 10.8 million

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